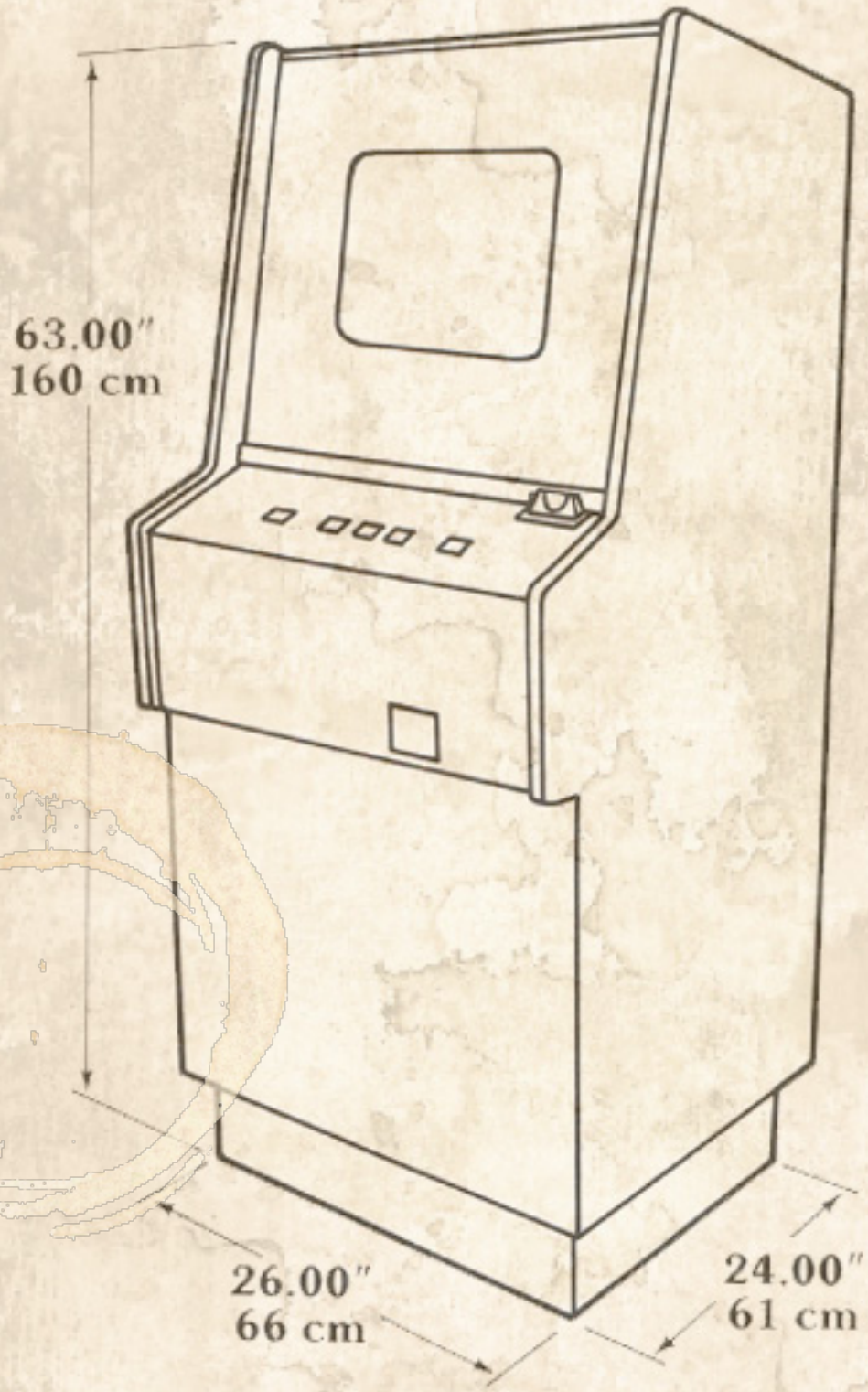
The ARCADE VIDEO-GAME "Encyclopedia"

1970-1976



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DaddaRuleKonge

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I made this book because I like to have something to do, and I like doing this sort of stuff. Cataloguing and stuff... This book (or PDF) is one in a long line of PDFs I have made since 2012. Arcade machines have never been a part of my childhood as most machines were few between and cost more than what I usually had in my pocket at the time. But I have always been fascinated by the machines (just like Pinball, also something I never really played), and to learn more of a subject, I make a book...
That's why I guess.
This book is not a real encyclopedia (that's why I put "quotation marks" on the cover), as it will almost certainly include several errors and wrong facts. But I have tried to make it as accurate as possible.

This book is a compilation of text and pictures from the internet. Nothing is written by me, and not one picture is mine.
This is (maybe) the first volume in the the arcade series of books I hope to make. The first book does include a lot of "wall-of-text", but I have tried to make the book well presented and easy to look. But I must warn you that spelling and grammar errors are present, since English is not my first language.
I made this book mostly for myself as a learning tool to get more familiar with the arcade history and games. I have tried to make the book well presented and easy to look through. But I must warn you that spelling and grammar errors are present.
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Weight: 155 pounds

Dimensions: 32¾ in. wide, 23¾ in. deep, 40 in. high

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"Joy-Stick" control allows player **Horizontal** and **Angular,** as well as vertical control of Paddle. Players can rush the net, miss the ball, retreat and attempt second hit. Ball may also be hit two or three times on each side of net.

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The History of Arcade Video Games

An arcade game or coin-op is a coin-operated entertainment machine typically installed in public businesses such as restaurants, bars and amusement arcades. Most arcade games are video games, pinball machines, electro-mechanical games, redemption games or merchandisers.

The first popular "arcade games" included early amusement-park midway games such as shooting galleries, ball-toss games, and the earliest coin-operated machines, such as those that claimed to tell a person's fortune or that played mechanical music. The old Midways of 1920s-era amusement parks (such as Coney Island in New York) provided the inspiration and atmosphere for later arcade games. In the 1930s the first coin-operated pinball machines emerged. These early amusement machines differed from their later electronic cousins in that they were made of wood. They lacked plungers or lit-up bonus surfaces on the playing field, and used mechanical instead of electronic scoring-readouts. By around 1977 most pinball machines in production switched to using solid-state electronics both for operation and for scoring.

1932 Ballyhoo piball machine

In 1966, Sega introduced an electro-mechanical game called Periscope - an early submarine simulator and light gun shooter which used lights and plastic waves to simulate sinking ships from a submarine. It became an instant success in Japan, Europe, and North America, where it was the first arcade game to cost a quarter per play, which would remain the standard price for arcade games for many years to come. In 1967 Taito released an electro-mechanical arcade game of their own, Crown Soccer Special, a two-player sports game that simulated association football, using various electronic components, including electronic versions of pinball flippers.

Sega later produced gun games which resemble first-person shooter video games, but which were in fact electro-mechanical games that used rear image projection in a manner similar to the ancient zoetrope to produce moving animations on a screen. The first of these, the light-gun game Duck Hunt, appeared in 1969; it featured animated moving targets on a screen, printed out the player's score on a ticket, and had volume-controllable sound-effects. That same year, Sega released an electro-mechanical arcade racing game, Grand Prix, which had a first-person view, electronic sound, a dashboard with a racing wheel and accelerator, and a forward-scrolling road projected on a screen. Another Sega 1969 release, Missile, a shooter and vehicle-combat simulation, featured electronic sound and a moving film strip to represent the targets on a projection screen. It was the earliest known arcade game to feature a joystick with a fire button, which formed part of an early dual-control scheme, where two directional buttons are used to move the player's tank and a two-way joystick is used to shoot and steer the missile onto oncoming planes displayed on the screen; when a plane is hit, an animated explosion appears on screen, accompanied by the sound of an explosion. In 1970 Midway released the game in North America as S.A.M.I.. In the same year, Sega released Jet Rocket, a combat flight-simulator featuring cockpit controls that could move the player aircraft around a landscape displayed on a screen and shoot missiles onto targets that explode when hit.

In 1971 students at Stanford University set up the Galaxy Game, a coin-operated version of the Spacewar video game. This ranks as the earliest known instance of a coin-operated video game. Later in the same year, Nolan Bushnell created the first mass-manufactured game, Computer Space, for Nutting Associates.

In 1972, Atari was formed by Nolan Bushnell and Ted Dabney. Atari essentially created the coin-operated video game industry with the game Pong, the first successful electronic ping pong video game. Pong proved to be popular, but imitators helped keep Atari from dominating the fledgling coin-operated video game market.

In the early 1970s to mid 1980s, the era of greatest popularity and technological innovation for arcade video games, the industry came to what is called "the golden age of arcade video games".

The golden age was a time of great technical and design creativity in arcade games. The era saw the rapid spread of video arcades across North America, Europe, and Asia. The number of video game arcades in North America, for example, more than doubled between 1980 and 1982; reaching a peak of 10,000 video game arcades across the region (compared to 4,000 as of 1998). Beginning with Space Invaders, video arcade games also started to appear in supermarkets, restaurants, liquor stores, gas stations and many other retail establishments looking for extra income. Video game arcades at the time became as common as convenience stores, while arcade games like Pac-Man and Space Invaders would appear in most locations across the United States, including even funeral homes. The sales of arcade video game machines increased significantly during this period, from $50 million in 1978 to $900 million in 1981, with 500,000 arcade machines sold in the United States at prices ranging as high as $3000 in 1982 alone. By 1982, there were 24,000 full arcades, 400,000 arcade street locations and 1.5 million arcade machines active in North America. The market was very competitive; the average life span of an arcade game was four to six months. Some games like Robby Roto failed because they were too complex to learn quickly, and others like Star Fire because they were too unfamiliar to the audience. Qix was briefly very popular but, Taito's Keith Egging later said, "too mystifying for gamers ... impossible to master and when the novelty wore off, the game faded". At around this time, the home video game industry (second-generation video game consoles and early home computer games) emerged as "an outgrowth of the widespread success of video arcades" at the time.

While color monitors had been used by several racing video games before (such as Indy 800 and Speed Race Twin), it was during this period that RGB color graphics became widespread, following the release of Galaxian in 1979. Namco's Rally-X in 1980 featured multi-directional scrolling, and introduced a radar tracking the player position. Sega's Space Tactics that year was a space combat game allowing multi-directional scrolling from a first-person perspective. The following year, Namco's Bosconian allowed the player's ship to freely move across open space that scrolls in all directions. By the early 1980s, scrolling had become popular among arcade video games and would make its way to third-generation consoles, where it would prove nearly as pivotal as the move to 3D graphics on later fifth-generation consoles.

The Golden Age also saw developers experimenting with vector displays, which produced crisp

lines that couldn't be duplicated by raster displays. A few of these vector games became great hits, such as 1979's Asteroids, 1980's Battlezone and Tempest and 1983's Star Wars from Atari, as well as 1982's Star Trek from Sega. However, vector technology fell out of favor with arcade game companies due to the high cost of repairing vector displays.

Several developers at the time were also experimenting with pseudo-3D and stereoscopic 3D using 2D sprites on raster displays. In 1979, Nintendo's Radar Scope introduced a three-dimensional third-person perspective to the shoot 'em up genre, later imitated by shooters such as Konami's Juno First and Activision's Beamrider in 1983. In 1981, Sega's Turbo was the first racing game to feature a third-person rear view format, and use sprite scaling with full-colour graphics. Namco's Pole Position featured an improved rear-view racer format in 1982 that would remain the standard for the genre; the game provided a perspective view of the track, with its vanishing point swaying side to side as the player approaches corners, accurately simulating forward movement into the distance. That same year, Sega released Zaxxon, which introduced the use of isometric graphics and shadows; and SubRoc-3D, which introduced the use of stereoscopic 3D through a special eyepiece;

This period also saw significant advances in digital audio technology. Space Invaders in 1978 was the first game to use a continuous background soundtrack, with four simple chromatic descending bass notes repeating in a loop, though it was dynamic and changed pace during stages. Rally-X in 1980 was the first game to feature continuous background music, which was generated using a dedicated sound chip, a Namco 3-channel PSG. That same year saw the introduction of speech synthesis, which was first used in Stratovox, released by Sun Electronics in 1980, followed soon after by Namco's King & Balloon, which was an early example of multiple CPUs, using two Z80 microprocessors, the second to drive a DAC for speech. Multi-CPUs were used by several arcade games the following year, including Frogger, which used two Z80 microprocessors and an AY-3-8910 PSG sound chip, and Scramble, which used two Z80 microprocessors and two AY-3-8910 sound chips. In 1983, Gyruss, known for its stereo sound and musical score, utilized multi CPUs, which included two Z80 microprocessors, one 6809 microprocessor, and one 8039 microprocessor, along with five AY-3-8910 sound chips and a DAC for the sound. That same year, the Namco Pole Position system used two Z8002 microprocessors and one Z80 microprocessor, along with a Namco 6-channel stereo PSG sound chip for the sound.

Developers also experimented with laserdisc players for delivering full motion video based games with movie-quality animation. The first laserdisc video game to exploit this technology was 1983's Astron Belt from Sega, soon followed by Dragon's Lair from Cinematronics; the latter was a sensation when it was released (and, in fact, the laserdisc players in many machines broke due to overuse). While laserdisc games were usually either shooter games with full-motion video backdrops like Astron Belt or interactive movies like Dragon's Lair, Data East's 1983 game Bega's Battle introduced a new form of video game storytelling: using brief full-motion video cutscenes to develop a story between the game's shooting stages, which would years later become the standard approach to video game storytelling. By the mid-1980s, the genre dwindled in popularity, as laserdiscs were losing out to the VHS format and the laserdisc games themselves were losing their novelty, due to their linearity and, in many cases, depending less on reflexes than on memorizing sequences of moves.

Some games of this era were so popular that they entered popular culture. The first to do so was Space Invaders. The game was so popular upon its release in 1978 that an urban legend blamed it for a national shortage of 100 yen coins in Japan, leading to a production increase of coins to meet demand for the game (although 100 yen coin production was lower in 1978 and 1979 than in previous or subsequent years, and the claim does not withstand logical scrutiny: arcade operators would have emptied out their machines and taken the money to the bank, thus keeping the coins in circulation). It would soon have a similar impact in North America, where it has appeared or is referenced in numerous facets of popular culture. By 1980, 86% of the 13–20 population in the United States had played arcade video games, and by 1981, there were more than 35 million gamers visiting video game arcades in the United States.

The game that most affected popular culture in North America was Pac-Man. Its release in 1980 caused such a sensation that it initiated what is now referred to as "Pac-Mania" (which later became the title of the last coin-operated game in the series, released in 1987). Though no one could agree what the "hero" or enemies represented (they were variously referred to as ghosts, goblins or monsters), the game was extremely popular.

Arcade games at the time affected on the music industry, revenues for which had declined by $400 million between 1978 and 1981 (from $4.1 billion to $3.7 billion), a decrease that was directly credited to the rise of arcade games at the time. Successful songs based on video games also began appearing. The pioneering electronic music band Yellow Magic Orchestra (YMO) sampled Space Invaders sounds in their 1978 self-titled album and the hit single "Computer Game" from the same album, the latter selling over 400,000 copies in the United States. In turn, YMO would have a major influence on much of the video game music produced during the 8-bit and 16-bit eras. The song "Pac-Man Fever" reached No. 9 on the Billboard Hot 100 and sold over a million singles in 1982, while the album Pac-Man Fever sold over a million records, with both receiving Gold certifications. That same year, R. Cade and the Video Victims also produced an arcade-inspired album, Get Victimized, featuring songs such as "Donkey Kong". In 1984, former YMO member Haruomi Hosono produced an album entirely from Namco arcade game samples entitled Video Game Music, an early example of a chiptune record and the first video game music album.

Arcade games also influenced the film industry; beginning with Space Invaders, arcade games began appearing at many movie theaters, while early films based on video games were also produced, most notably Tron, which grossed over $33 million in 1982 which began the Tron franchise which included a video game adaptation that grossed more than the film. Other films based on video games included the 1983 films WarGames (where Matthew Broderick plays Galaga at an arcade), Nightmares, and Joysticks, the 1984 film The Last Starfighter, and the anime Super Mario Bros.: Peach-Hime Kyushutsu Dai Sakusen! in 1986.

The golden age cooled around the mid-1980s as copies of popular games began to saturate the arcades. Arcade video game revenues in the United States had declined from $8 billion in 1981 and $7 billion in 1982 to $5 billion in 1983, reaching a low of $4 billion in 1986. Despite this, arcades would remain commonplace through to the early 1990s as there were still new genres being explored. In 1987, arcades experienced a short resurgence with Double Dragon, which started the golden age of beat 'em up games, a genre that would peak in popularity with Final Fight two years later. In 1988, arcade game revenues in the United States rose back up to $6.4 billion, largely due to the rising popularity of

violent action games in the beat 'em up and run and gun shooter genres. After yet another relative decline, U.S. arcade video game revenues had fallen to $2.1 billion by 1991, by which time the sales of arcade machines had declined, with 4000 unit sales being considered a hit at the time.

One of the causes of decline was new generations of personal computers and video game consoles that sapped interest from arcades. In the early 1990s, the Genesis/Mega Drive and Super NES/Super Famicom greatly improved home play and some of their technology was even integrated into a few video arcade machines.

Sega AM2's Hang-On, designed by Yu Suzuki and running on the Sega Space Harrier hardware, was the first of Sega's "Super Scaler" arcade system boards that allowed pseudo-3D sprite-scaling at high frame rates. The pseudo-3D sprite/tile scaling was handled in a similar manner to textures in later texture-mapped polygonal 3D games of the 1990s. It was controlled using a video game arcade cabinet resembling a motorbike, which the player moves with their body. This began the "Taikan" trend, the use of motion-controlled hydraulic arcade cabinets in many arcade games of the late 1980s, two decades before motion controls became popular on video game consoles.

In the early 1990s, the arcades experienced a major resurgence with the 1991 release of Capcom's Street Fighter II, which popularized competitive fighting games and revived the arcade industry to a level of popularity not seen since the days of Pac-Man, setting off a renaissance for the arcade game industry in the early 1990s. Its success led to a wave of other popular games which mostly were in the fighting genre, such as Pit-Fighter (1990) by Atari, Mortal Kombat by Midway Games and The King of Fighters (1994–2005) by SNK.

3D polygon graphics were popularized by the Sega Model 1 games Virtua Racing (1992) and Virtua Fighter (1993), followed by racing games like the Namco System 22 title Ridge Racer (1993) and Sega Model 2 title Daytona USA, and light gun shooters like Sega's Virtua Cop (1994) and Mesa Logic's Area 51 (1995), gaining considerable popularity in the arcades. By 1994, arcade games in the United States were generating revenues of $7 billion in quarters (equivalent to $11.3 billion in 2016), in comparison to home console game sales of $6 billion, with many of the best-selling home video games in the early 1990s often being arcade ports. Combined, total US arcade and console game revenues of $13 billion in 1994 ($21 billion in 2016) was nearly two and a half times the $5 billion revenue grossed by movies in the United States at the time.

Around the mid-1990s, the fifth-generation home consoles, Sega Saturn, PlayStation, and Nintendo 64, began offering true 3D graphics, improved sound, and better 2D graphics, than the previous generation. By 1995, personal computers followed, with 3D accelerator cards. While arcade systems such as the Sega Model 3 remained considerably more advanced than home systems in the late 1990s, the technological advantage that arcade games had, in their ability to customize and use the latest graphics and sound chips, slowly began narrowing, and the convenience of home games eventually caused a decline in arcade gaming. Sega's sixth generation console, the Dreamcast, could produce 3D graphics comparable to the Sega NAOMI arcade system in 1998, after which Sega produced more powerful arcade systems such as the Sega NAOMI Multiboard and Sega Hikaru in 1999 and the Sega NAOMI 2 in 2000, before Sega eventually stopped manufacturing expensive proprietary arcade system boards, with their subsequent arcade boards being based on more affordable commercial console or PC components.

Arcade video games had declined in popularity so much by the late 1990s, that revenues in the United States dropped to $1.33 billion in 1999, and reached a low of $866 million in 2004. The gap in release dates and quality between console ports and the arcade games they were ported from dramatically narrowed, thus setting up home consoles as a major competitor with arcades. Furthermore, by the early 2000s, networked gaming via computers and then consoles across the Internet had also appeared, replacing the venue of head-to-head competition and social atmosphere once provided solely by arcades. The arcades also lost their status as the forefront of new game releases. Given the choice between playing a game at an arcade three or four times (perhaps 15 minutes of play for a typical arcade game), and renting, at about the same price, exactly the same game—for a video game console—the console became the preferred choice. Fighting games were the most attractive feature for arcades, since they offered the prospect of face-to-face competition and tournaments, which correspondingly led players to practice more (and spend more money in the arcade), but they could not support the business all by themselves.

To remain viable, arcades added other elements to complement the video games such as redemption games, merchandiser games, and food service, typically snacks and fast food. Referred to as "fun centers" or "family fun centers", some of the longstanding chains such as Chuck E. Cheese's and Gatti's Pizza ("GattiTowns") also changed to this format. Many 1980s-era video game arcades have long since closed, and classic coin-operated games have become largely the province of dedicated gamers and hobbyists. In the 2010s, some movie theaters and family fun centers still have small arcades.

In the 2000s and 2010s, arcades have found a niche market by providing games that use special controllers largely inaccessible to home users, such as dance games that have a floor that senses the user's dancing. An alternative interpretation (one that includes fighting games, which continue to thrive and require no special controller) is that the arcade is now a more socially-oriented hangout, with games that focus on an individual's performance, rather than the game's content, as the primary form of novelty. Examples of today's popular genres are rhythm games such as Dance Dance Revolution (1998) and DrumMania (1999), and rail shooters such as Virtua Cop (1994) and House of the Dead (1996). In the Western world, the arcade video game industry still exists, but in a greatly reduced form. Video arcade game hardware is often based on home game consoles to reduce development costs; there are video arcade versions of Dreamcast (NAOMI, Atomiswave), PlayStation 2 (System 246), Nintendo GameCube (Triforce), and Microsoft Xbox (Chihiro) home consoles and PC (e.g. Taito Type X). Some arcades have survived by expanding into ticket-based prize redemption and more physical games with no home console equivalent, such as skee ball and Whac-A-Mole. Some genres, particularly dancing and rhythm games (such as Konami's Dance Dance Revolution), continue to be popular in arcades.

Worldwide, arcade game revenues gradually increased from $1.8 billion in 1998 to $3.2 billion in 2002, rivalling PC game sales of $3.2 billion that same year. In particular, arcade video games are a thriving industry in China, where arcades are widespread across the country. The US market has also experienced a slight resurgence, with the number of video game arcades across the nation increasing from 2,500 in 2003 to 3,500 in 2008, though this is significantly less than the 10,000 arcades in the early 1980s. As of 2009, a successful arcade game usually sells around 4000 to 6000 units worldwide.

The relative simplicity yet solid gameplay of many of these early games has inspired a new generation of fans who can play them on mobile phones

or with emulators such as MAME. Some classic arcade games are reappearing in commercial settings, such as Namco's Ms. Pac-Man 20 Year Reunion / Galaga Class of 1981 two-in-one game, or integrated directly into controller hardware (joysticks) with replaceable flash drives storing game ROMs. Arcade classics have also been reappearing as mobile games, with Pac-Man in particular selling over 30 million downloads in the United States by 2010. Arcade classics have also begun to appear on multi-game arcade machines for home users.

In the Japanese gaming industry, arcades have remained popular through to the present day. As of 2009, out of Japan's $20 billion gaming market, $6 billion of that amount is generated from arcades, which represent the largest sector of the Japanese video game market, followed by home console games and mobile games at $3.5 billion and $2 billion, respectively. In 2005, arcade ownership and operation accounted for a majority of Namco's for example. With considerable withdrawal from the arcade market from companies such as Capcom, Sega became the strongest player in the arcade market with 60% marketshare in 2006. Despite the global decline of arcades, Japanese companies hit record revenue for three consecutive years during this period. However, due to the country's economic recession, the Japanese arcade industry has also been steadily declining, from ¥702.9 billion ($8.7 billion) in 2007 to ¥504.3 billion ($6.2 billion) in 2010. In 2013, estimation of revenue is ¥470 billion.

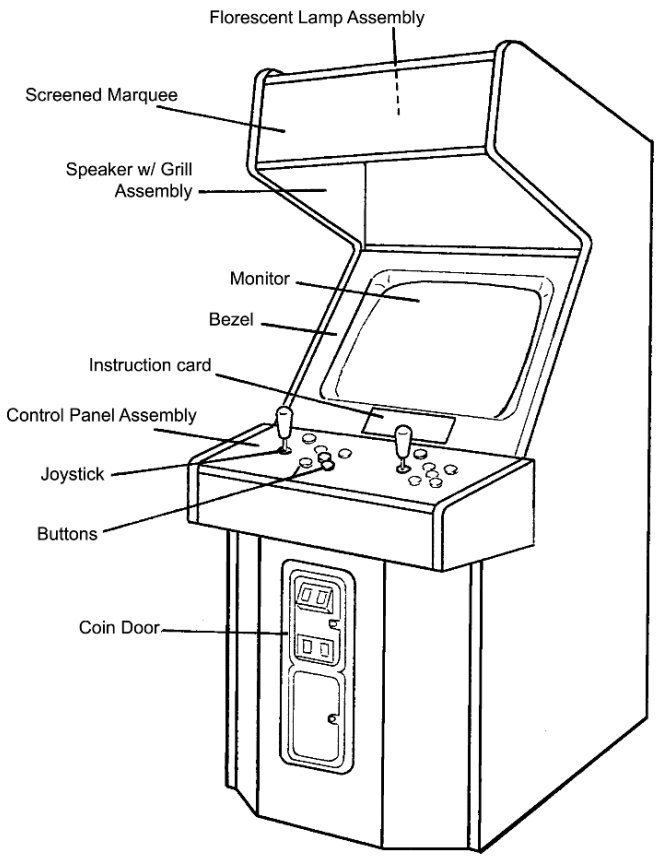
In the Japanese market, network and card features introduced by Virtua Fighter 4 and World Club Champion Football, and novelty cabinets such as Gundam Pod machines have caused revitalizations in arcade profitability in Japan. The reason for the continued popularity of arcades in comparison to the west, are heavy population density and an infrastructure similar to casino facilities.

Former rivals in the Japanese arcade industry, Konami, Taito, Bandai Namco Entertainment and Sega, are now working together to keep the arcade industry vibrant. This is evidenced in the sharing of arcade networks, and venues having games from all major companies rather than only games from their own company.

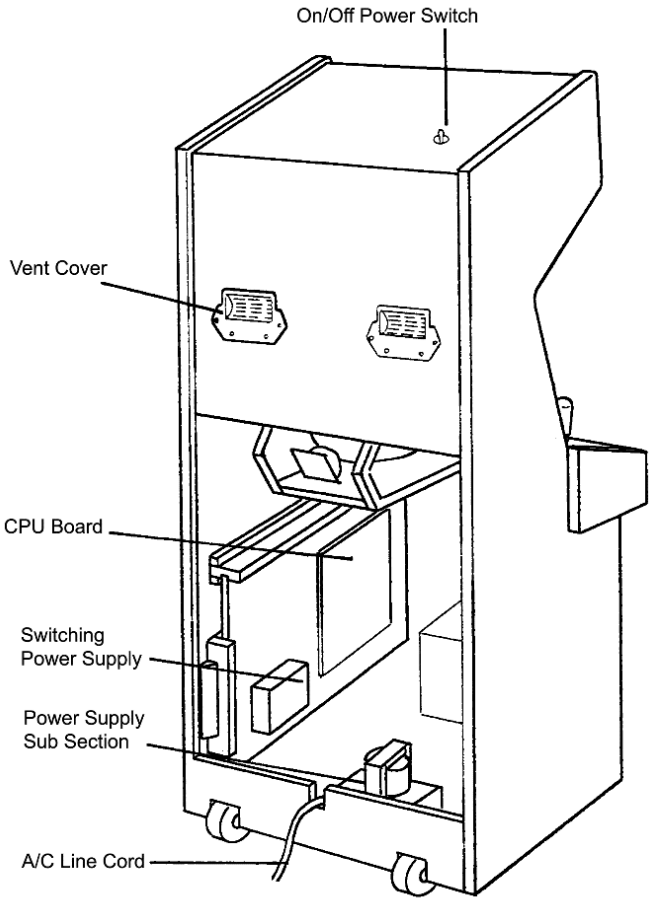
A video game arcade cabinet, also known as a video arcade machine or video coin-op, is the housing within which a video arcade game's hardware resides. Most cabinets designed since the mid-1980s conform to the JAMMA wiring standard. Some include additional connectors for features not included in the standard.

Because arcade cabinets vary according to the games they were built for or contain, they may well not possess all of the parts listed below:

- A monitor, on which the game is displayed. They may display either raster or vector graphics, raster being most common. Standard resolution is between 262.5 and 315 vertical lines, depending on the refresh rate (usually between 50 and 60 Hz). Slower refresh rates allow for better vertical resolution. Monitors may be oriented horizontally or vertically, depending on the game. Some games use more than one monitor. Some newer cabinets have monitors that can display high-definition video.
- Printed circuit boards (PCB) or arcade system boards, the actual hardware upon which the game runs. Hidden within the cabinet. Some systems, such as the SNK Neo-Geo MVS, use a main board with game carts. Some main boards may hold multiple game carts as well.
- A power supply to provide DC power to the arcade system boards and low voltage lighting for the coin slots and lighted buttons.
- A marquee, a sign above the monitor displaying the game's title. They are often brightly colored and backlit.
- A bezel, which is the border around the monitor. It may contain instructions or artwork.
- A control panel, a level surface near the monitor, upon which the game's controls are arranged. Control panels sometimes have playing instructions. Players often pile their coins or tokens on the control panels of upright and cocktail cabinets.
- Coin slots, coin returns and the coin box, which allow for the exchange of money or tokens. They are usually below the control panel. Very often, translucent red plastic buttons are placed in between the coin return and the coin slot. When they are pressed, a coin or token that has become jammed in the coin mechanism is returned to the player. Early coin slots could be defeated using a piezo-electric gas fire or gas oven igniter held against the steel bodywork of the cabinet, thus enabling free credits to be obtained. In some arcades, the coin slot is replaced with a card reader that reads data from a game card bought from the arcade operator.



Front View of typical JAMMA Cabinet



Rear View

Pictures from "jammaboards.com"

The sides of the arcade cabinet are usually decorated with brightly coloured stickers or paint, representing the gameplay of their particular game.

There are many types of arcade cabinets, some in fact being custom-made for a particular game; however, the most common are the upright, the cocktail or table, and the sit-down.

Upright cabinets

Upright cabinets are by far the most common in North America. They are usually made of wood and metal, about six feet or two meters tall, with the control panel set perpendicular to the monitor at slightly above waist level. The monitor is housed inside the cabinet, at approximately eye level. The marquee is above it, and often overhangs it.

Controls are most commonly a joystick for as many players as the game allows, plus action buttons and "player" buttons which serve the same purpose as the start button on console gamepads. Trackballs are sometimes used instead of joysticks, especially in games from the early 1980s. Spinners (knobs for turning, also called "paddle controls") are used to control game elements that move strictly horizontally or vertically, such as the paddles in Arkanoid and Pong. Games such as Robotron: 2084, Smash TV and Battlezone use double joysticks instead of action buttons. Some versions of the original Street Fighter had pressure-sensitive rubber pads instead of buttons.

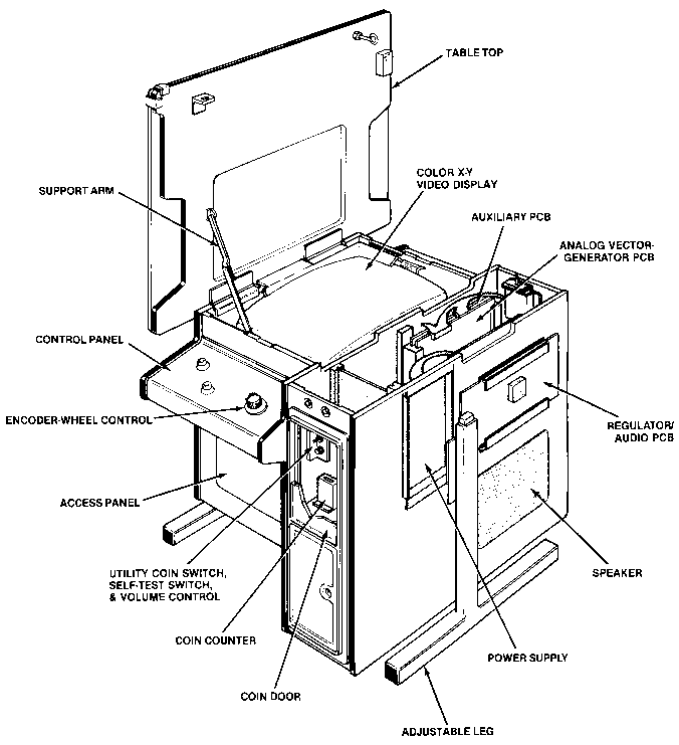
If an upright is housing a driving game, it may have a steering wheel and throttle pedal instead of a joystick and buttons. If the upright is housing a shooting game, it may have light guns attached to the front of the machine, via durable cables. Some arcade machines had the monitor placed at the bottom of the cabinet with a mirror mounted at around 45 degrees above the screen facing the player. This was done to save space, a large CRT monitor would otherwise poke out the back of the cabinet, and possibly to avoid eye strain from looking directly up-close at the monitor. To correct for the mirrored image, some games had an option to flip the video output using a dip switch setting. Other genres of game such as Guitar Freaks feature controllers resembling musical instruments.

Upright cabinet shape designs varies from the simplest symmetric perpendicular boxes as with Star Trek to complicated asymmetric forms.

Games are typically for one or two players; however, games such as Gauntlet feature as many as four sets of controls.

Cocktail or table cabinets

Cocktail cabinets are shaped like low, rectangular tables, with the controls usually set at either of the board ends, or, though not as common, at the narrow ends, and the monitor inside the table, the screen facing upward. Two-player games housed in cocktails were usually alternant, each player taking turns. The monitor reverses its orientation (game software controlled) for each player, so that everything seems right-side-up from each perspective. This requires special programming of the cocktail versions of the game (usually set by dip switches). The monitor's orientation is usually in player two's favour only in two-player games when it's player two's turn, and in player one's favour all other times. Simultaneous, 4 player games that are built as a cocktail include Warlords, and others.



Cocktail cabinet versions were usually released alongside the upright version of the same game. They were relatively common in the 1980s, especially during the Golden Age of Arcade Games, but have since lost popularity. Their main advantage over upright cabinets was their smaller size, making them seem less obtrusive, although requiring more floor space (more so by having players seated at each end). The top of the table was covered with a piece of tempered glass, making it convenient to set drinks on (hence the name), and they were often seen in bars and pubs.

Candy cabinets

Owing to the resemblance of the plastic to hard candy, they are often known as "candy cabinets", by both arcade enthusiasts and by people in the industry. They are also generally easier to clean and move than upright cabinets, but usually just as heavy as most have 29" screens, as opposed to 20"-25". They are positioned so that the player can sit down on a chair or stool and play for extended periods. SNK sold many Neo-Geo MVS cabinets in this configuration, though most arcade games made in Japan that only use a joystick and buttons will come in a sit-down cabinet variety. In Japanese arcades, this type of cabinet is generally more prevalent than the upright kind, and they are usually lined up in uniform-looking rows. A variant of this, often referred to as "versus-style" cabinets are designed to look like two cabinets facing each other, with two monitors and separate controls allowing two players to fight each other without having to share the same monitor and control area. Some newer cabinets can emulate these "versus-style" cabinets through networking.

Deluxe cabinets

Most commonly used for games involving gambling, long stints of gaming, or vehicles, such as fighting games, flight simulators, and racing games. These cabinets typically have equipment resembling the controls of a vehicle (though some of them are merely large cabinets with fair features such as a great screen or chairs). Driving games may have a bucket seat, foot pedals, a stick shift, and even an ignition, while flight simulators may have a flight yoke or joystick, and motorcycle games handle bars and a seat shaped like a full-size bike. Often, these cabinets are arranged side-by-side, to allow players to compete together. Some of these cabinets are very elaborate, and include hydraulics which move the player according to the action on screen. Sega is among the biggest manufacturers of these kinds of cabinets, while Namco released Ridge Racer Full Scale, in which the player sat in a full size Mazda MX-5 road car.

Cockpit and environmental cabinets

These are close relatives to deluxe cabinets except the player sits inside the game itself. Examples of this are games such as Star Wars, Sinistar or Discs of Tron.

Mini cabinets

The mini or cabaret is a squatter version of the upright cabinet. It may also have a smaller monitor. Mini cabinets spare bulk and are easier for small children to play than some full-size cabinets.

Countertop cabinets

Countertop or bartop cabinets are usually only large enough to house their monitors and control panels. They are often used for trivia and gambling-type games, and are usually found installed on bars or tables in pubs and restaurants. These cabinets often have touchscreen controls instead of traditional push-button controls. They are also fairly popular with home use, as they can be placed upon a table or countertop.

Large-scale satellite machines

Usually found in Japan, these machines have multiple screens interconnected to one system, sometimes with one big screen in the middle. These also often feature the dispensing of different type of cards, either a smartcard in order to save stats and progress, or trading cards used in the game.

Since arcade games are becoming increasingly popular as collectibles, an entire niche industry has sprung up focused on arcade cabinet restoration. There are many websites (both commercial and hobbyist) and newsgroups devoted to arcade cabinet restoration. They are full of tips and advice on restoring games to mint condition.

Artwork

Often game cabinets were used to host a variety of games. Often after the cabinet's initial game was removed and replaced with another, the cabinet's side art was painted over (usually black) so that the cabinet wouldn't misrepresent the game contained within. The side art was also painted over to hide damaged or faded artwork.

Of course, hobbyists prefer cabinets with original artwork in the best possible condition. Since machines with good quality art are hard to find, one of the first tasks is stripping any old artwork or paint from the cabinet. This is done with conventional chemical paint strippers or by sanding (preferences vary). Normally artwork cannot be preserved that has been painted over and is removed with any covering paint. New paint can be applied in any manner preferred (roller, brush, spray). Paint used is often just conventional paint with a finish matching the cabinet's original paint.

Many games had artwork which was silk-screened directly on the cabinets. Others used large decals for the side art. Some manufacturers produce replication artwork for popular classic games—each varying in quality. This side art can be applied over the new paint after it has dried. These appliqués can be very large and must be carefully applied to avoid bubbles or wrinkles from developing. Spraying the surface with a slightly soapy water solution allows the artwork to be quickly repositioned if wrinkles or bubbles develop like in window tinting applications.

Control panels, bezels, marquees

Acquiring these pieces is harder than installing them. Many hobbyists trade these items via newsgroups or sites such as eBay (the same is true for side art). As with side art, some replication art shops also produce replication artwork for these pieces that is indistinguishable from original. Some even surpass the originals in quality. Once these pieces are acquired, they usually snap right into place.

If the controls are worn and need replacing, if the game is popular, they can be easily obtained. Rarer game controls are harder to come by, but some shops stock replacement controls for classic arcade games. Some shops manufacture controls that are more robust than originals and fit a variety of machines. Installing them takes some experimentation for novices, but are usually not too difficult to place.

Monitors

Raster monitors are easier to service than vector monitors. Normally, unless the main tube is blown, a raster monitor will provide good display characteristics with perhaps a few minor color adjustments. Vector monitors, on the other hand, can be challenging or very costly to service, and some can't be repaired at all (they have dwindled in use since the 1980s and parts are hard to come by). Sometimes they will have to be replaced completely, but even finding replacement monitors is difficult since few, if any, are produced any longer. Bare new CRTs are still available from some suppliers (vector monitors use the same basic tube as a raster, just with different electronics), but as they are bare tubes they usually require the yoke to be removed from the old tube and fitted to the new tube and setting up, which isn't usually a job that can be undertaken by the amateur arcade collector. Retrofitting other monitor technologies to emulate vector graphics can also be done.

Some electronic components are stressed by the hot, cramped conditions inside a cabinet. Electrolytic capacitors dry out over time, and in many classic arcade cabinets their service life is nearing the end. If a game has its original raster monitor, it will usually need to be "re-capped"—that is, some capacitors will need to be replaced so the monitor will deliver a proper image. Due to the size of the capacitors and the voltages present inside a video monitor, this can be a dangerous activity and should only be attempted by experienced hobbyists or professionals. If a monitor is broken, a replacement can usually be obtained via coin-op distributors or parts suppliers. spray). Paint used is often just conventional paint with a finish matching the cabinet's original paint.

Wiring

If a cabinet needs rewiring, some wiring kits are available over the Internet. An experienced hobbyist can usually solve most wiring problems through trial and error.

Many cabinets are converted to be used to host a game other than the original. In these cases, if both games conform to the JAMMA standard, the process is simple. Other conversions can be more difficult, but some manufacturers such as Nintendo have produced kits to ease the conversion process (Nintendo manufactured kits to convert a cabinet from Classic wiring to VS. wiring).

DIY projects

Some cabinets are constructed entirely by hobbyists to mimic an arcade cabinet using emulators such as MAME and a PC to replace the game hardware. These home built cabinets have many of the features of real arcade cabinets (such as a coin box, marquees etc.). MAME arcade units can combine several arcade controls (such as two types of joysticks and a trackball) in one unit to enable play of many different games.

Other projects can involve converting a regular single game arcade cabinet into a MAME cabinet, eliminating the need for building a cabinet.

At least one company manufactures flat-pack style cabinet kits made from Medium-density fibreboard. These remove the need for the hobbyist to cut to shape large panels of the material, but still require assembly, painting and finishing; and fitting out with a game-system, controls and display.

Bespoke arcade cabinets can also be custom built to order, allowing the hobbyist to design the cabinet removing the manual skills necessary for putting a cabinet together.

Other projects have involved building DIY tabletop cabinets and disassembling the casing of Game Boy Advance handhelds thanks to the abundance of arcade classics compilations such as Namco Museum and other titles. Some pre-manufactured arcade cabinets were even introduced for using the iPad as a monitor.

The Japan Amusement Machine and Marketing Association, abbreviated JAMMA, is a Japanese trade association headquartered in Tokyo.

JAMMA is run by representatives from various arcade video game manufacturers, including Namco Bandai, Sega, Taito, Tecmo, Capcom, Konami and Atlus, among others.

The corporation was renamed after they merged with the Nihon Shopping Center Amusement Park Operator's Association (NSA) and the Japan Amusement Park Equipment Association (JAPEA).

Before 2012, JAMMA had been organizing an annual trade fair called the Amusement Machine Show for many years. In 2013, they began collaborating with the Amusement Machine Operators' Union (AOU), who had their own trade show, to promote a new event: the Japan Amusement Expo.

Connector standards

JAMMA is the namesake of a widely used wiring standard for arcade games. An arcade cabinet wired to JAMMA's specification can accept a motherboard for any JAMMA-compatible game. JAMMA introduced the standard in 1985; by the 1990s, most new arcade games were built to JAMMA specifications. As the majority of arcade games were designed in Japan at this time, JAMMA became the de facto standard internationally.

Before the JAMMA standard, most arcade PCBs, wiring harnesses, and power supplies were custom-built. When an old game became unprofitable, many arcade operators would rewire the cabinet and update the artwork in order to put different games in the cabinets. Reusing old cabinets made a lot of sense, and it was realized that the cabinets were a different market from the games themselves. The JAMMA standard allowed plug-and-play cabinets to be created (reducing the cost to arcade operators) where an unprofitable game could be replaced with another game by a simple swap of the game's PCB. This resulted in most arcade games in Japan (outside racing and gun shooting games that required deluxe cabinets) to be sold as conversion kits consisting of nothing more than a PCB, play instructions and an operator's manual.

The JAMMA standard uses a 56-pin edge connector on the board with inputs and outputs common to most video games. These include power inputs (5 volts for the game and 12 volts for sound); inputs for two joysticks, each with three action buttons and one start button; analog RGB video output with negative composite sync; single-speaker sound output; and inputs for coin, service, test, and tilt.

The connector circuitry of some later games, such as Street Fighter II: The World Warrior (1991) and X-Men (1992), implement extra buttons, different controller types, or support more players by adding extra connectors—or even by utilizing dormant JAMMA pins. Circuitry designs that overstep the JAMMA specification in this way are unofficially called JAMMA+.

JAMMA Video Standard

The JAMMA Video Standard (JVS) is a newer JAMMA connector standard designed for contemporary USB peripherals. The standard specifies communication protocols and physical interfaces for peripheral devices.

Per the first edition of the JVS, published in 1996, peripheral devices connect to a dedicated I/O board. The main board connects to the I/O board via an USB Type-A to USB Type-B interface cable, and peripherals connect to the I/O board via USB-A.

JAMMA published the second edition of the JVS on 17 July 1997, and the third edition on 31 May 2000. The third edition adds support for ASCII and Shift-JIS output; device drivers for secondary and tertiary input devices; a device driver for a mahjong controller; and recommended values for SYNC-code timing.

Amusement Machine Prize guideline

The Amusement Machine prize guideline is a guide for the type of prize that should be provided by arcade operator. The standard was enacted in 1 November 2004. It specifies the retail value of a prize item cannot exceed 800 yen. In addition, following items cannot be manufactured, sold, or transferred to arcades as prizes:

- Tobacco and tobacco-themed items
- Alcohol and alcohol-themed items
- Drugs, or items containing material that causes high, dizziness, hallucination
- Medium containing contents that interferes with proper youth growth or good social order
- Items for sex, and items resembling sexual organs
- Underwear
- Coupon or similar items
- Item violating food safety laws
- Counterfeit brand or counterfeit character items, or items violating intellectual property
- Item causing physical or mental harm (e.g., weapons)
- Life forms violating the spirit of animal protection

Megalo City 29-inch 15KHz JAMMA arcade machine. (Based on the look of Sega's New Versus City cabinets)

Video game console emulators are programs that allow a personal computer or video game console to emulate another video game console. They are most often used to play older 1980s-era video games on 2010s-era personal computers and more contemporary video game consoles. They are also used to translate games into other languages, to modify existing games, and in the development process of "home brew" DIY demos and in the creation of new games for older systems. The Internet has helped in the spread of console emulators, as most - if not all - would be unavailable for sale in retail outlets.

MAME

MAME (originally an acronym of Multiple Arcade Machine Emulator) is a free and open source emulator designed to recreate the hardware of arcade game systems in software on modern personal computers and other platforms. The intention is to preserve gaming history by preventing vintage games from being lost or forgotten. The aim of MAME is to be a reference to the inner workings of the emulated arcade machines; the ability to actually play the games is considered "a nice side effect". Joystiq has listed MAME as an application that every gamer should have.

The first public MAME release (0.1) was on February 5, 1997, by Nicola Salmoria. The emulator now supports over seven thousand unique games and ten thousand actual ROM image sets, though not all of the supported games are playable. MESS, an emulator for many video game consoles and computer systems, based on the MAME core, was integrated upstream into MAME in 2015.

The project was started by the Italian programmer Nicola Salmoria. MAME traces its roots to an earlier emulator project called Multi-Pac, but the name was changed as more and more games started to be emulated within the MAME framework. In April 1997, Salmoria stepped down for his national service commitments, handing stewardship of the project to fellow Italian Mirko Buffoni for a period of half a year. In May 2003, David Haywood took over the job of the coordinator. From April 2005 to April 2011, the project was coordinated by Aaron Giles. Angelo Salese stepped in as the new coordinator. In 2012, Miodrag Milanovic took over. The project is supported by hundreds of developers around the world and thousands of outside contributors.

At first, MAME was developed exclusively for MS-DOS, but it was soon ported to Unix-like systems (X/MAME), Macintosh (MacMAME and later MAME OS X) and Windows (MAME32). Since 24 May 2001 with version 0.37b15, the main development occurs on the Windows platform, and most other platforms are supported through the SDLMAME project, which was integrated into the main development source tree in 2006. In addition, different versions of MAME have been ported to other computers, game consoles, mobile phones and PDAs, and at one point even to digital cameras. In 2012, Google ported MAME to Native Client, which allows MAME to run inside Chrome.

Major releases of MAME occur approximately once a month. Windows executables in both 32-bit and 64-bit fashion are released on the official web site of the development team, along with the complete source code. Smaller, incremental "u" (for update) releases were released weekly (until version 0.149u1) as source diffs against the most recent major version, to keep code in synchronization among developers. The MAME source code is developed on a public GitHub repository. This allows those with the required expertise & tools to build the most up-to-date version of the code and contribute enhancements in the form of Pull Requests.

The architecture of MAME has been extensively improved over the years. Support for both raster and vector displays, as well as multiple CPUs and sound chips, were added to MAME in the first six months of the project. A flexible timer system to coordinate the synchronization between multiple emulated CPU cores was implemented, and ROM images started to be loaded according to their CRC32 hash in the ZIP files they were stored in. MAME has pioneered the reverse engineering of many undocumented system architectures, various CPUs (such as the M6809-derivative custom Konami CPU with new instructions) and sound chips (for example the Yamaha FM sound chips), and MAME developers have been instrumental in the reverse engineering of many proprietary encryption algorithms utilized in arcade games. Examples of these include the Neo Geo, CP System II, CP System III and many others.

The popularity of MAME has well since broken through to the mainstream, with enthusiasts building their own arcade game cabinets to relive the old games, and with companies producing illegal derivative works of MAME to be installed in arcades. Cabinets can be built either from scratch or by taking apart and modifying a genuine arcade game cabinet that was once used with the real hardware inside. Cabinets inspired by classic arcade games can also be purchased and assembled (with optional PC and MAME preinstalled).

Although MAME contains a rudimentary user interface, the use of MAME in arcade game cabinets and home theater PCs necessitates special launcher applications called front ends with more advanced user interfaces. Front ends provide varying degrees of customization – allowing one to see images of the cabinets, history of the games and tips on how to play, and even video of the game play or attract mode of the game.

The information contained within MAME is free for re-use, and companies have been known to utilize MAME when recreating their old classics on modern systems. Some have gone as far as to hire MAME developers to create emulators for their old properties. An example of this is the Taito Legends pack.

Since 2012 MAME is maintained by then MESS project leader Miodrag Milanović.

On May 27, 2015 (0.162), the games console and computer system emulator MESS was integrated with MAME.

In May 2015, it was announced that MAME's developers were planning to re-license the software under a more common free and open source license, away from the original MAME-license. MAME developer Miodrag Milanovic explained that the change is intended to draw more developer interest to the project, allow the manufacturers of games to distribute MAME to emulate their own games, and make the software a "learning tool for developers working on development boards". The transition of MAME's licensing to the BSD/GPL licenses was completed in March 2016. With the license change, most of MAME's source code (90%+) is available under a three-clause BSD license and the complete project is under the GNU General Public License version 2 or later.

On Feb 24, 2016 (0.171), MAME embedded MEWUI front-end (and developer joined the team), providing MAME with a flexible and more full-featured UI.

The MAME core coordinates the emulation of several elements at the same time. These elements replicate the behavior of the hardware present in the original arcade machines. MAME can emulate many different central processing units (CPUs) and associated hardware. These elements are virtualized so MAME acts as a software layer between the original program of the game, and the platform MAME runs

on. MAME supports arbitrary screen resolutions, refresh rates and display configurations. Multiple emulated monitors, as required by for example Darius, are supported as well.

Individual arcade systems are specified by drivers which take the form of C preprocessor macros. These drivers specify the individual components to be emulated and how they communicate with each other. While MAME was originally written in C, the need for object oriented programming caused the development team to begin to compile all code as C++ for MAME 0.136, taking advantage of additional features of that language in the process.

Although a great majority of the CPU emulation cores are interpretive, MAME also supports dynamic recompilation through an intermediate language called the Universal Machine Language (UML) to increase the emulation speed. Back-end targets supported are x86 and x64. A C backend is also available to further aid verification of the correctness. CPUs emulated in this manner are SH-2, MIPS R3000 and PowerPC.

The original program code, graphics and sound data need to be present so that the game can be emulated. In most arcade machines, the data is stored in read-only memory chips (ROMs), although other devices such as cassette tapes, floppy disks, hard disks, laserdiscs, and compact discs are also used. The contents of most of these devices can be copied to computer files, in a process called "dumping". The resulting files are often generically called ROM images or ROMs regardless of the kind of storage they came from. A game usually consists of multiple ROM and PAL images; these are collectively stored inside a single ZIP file, constituting a ROM set. In addition to the "parent" ROM set (usually chosen as the most recent "World" version of the game), games may have "clone" ROM sets with different program code, different language text intended for different markets etc. For example, Street Fighter II Turbo is considered a variant of Street Fighter II Champion Edition. System boards like the Neo Geo that have ROMs shared between multiple games require the ROMs to be stored in "BIOS" ROM sets and named appropriately.

Hard disks, compact discs and laserdiscs are stored in a MAME-specific format called CHD (Compressed Hunks of Data). Some arcade machines use analog hardware, such as laserdiscs, to store and play back audio/video data such as soundtracks and cinematics. This data must be captured and encoded into digital files that can be read by MAME. MAME does not support the use of external analog devices, which (along with identical speaker and speaker enclosures) would be required for a 100% faithful reproduction of the arcade experience. A number of games use sound chips that have not yet been emulated successfully. These games require sound samples in WAV file format for sound emulation. MAME additionally supports artwork files in PNG format for bezel and overlay graphics.

The stated aim of the project is to document hardware, and so MAME takes a somewhat purist view of emulation, prohibiting programming hacks that might make a game run improperly or run faster at the expense of emulation accuracy. Components such as CPUs are emulated at a low level (meaning individual instructions are emulated) whenever possible, and high-level emulation (HLE) is only used when a chip is completely undocumented and cannot be reverse-engineered in detail. Signal level emulation is used to emulate audio circuitry that consists of analog components.

> We want to document the hardware. Now a lot of people will say; "Where's your document? You just write a bunch of source code." And yes, that's true. One thing I've learned is that keeping documentation synced with source code is nearly impossible. The best proof that your documentation is right is "does this code work".
>
> —Aaron Giles, California Extreme 2008 |

MAME emulates well over a thousand different arcade system boards, a majority of which are completely undocumented and custom designed to run either a single game or a very small number of them. The approach MAME takes with regards to accuracy is an incremental one; systems are emulated as accurately as they reasonably can be. Bootleg copies of games are often the first to be emulated, with proper (and copy protected) versions emulated later. Besides encryption, arcade games were usually protected with custom microcontroller units (MCUs) that implemented a part of the game logic or some other important functions. Emulation of these chips is preferred even when they have little or no immediately visible effect on the game itself. For example, the monster behavior in Bubble Bobble was not perfected until the code and data contained with the custom MCU was dumped through the decapping of the chip. This results in the ROM set requirements changing as the games are emulated to a more and more accurate degree.

Portability and genericity are also important to MAME. Combined with the uncompromising stance on accuracy, this often results in high system requirements. Although a 2 GHz processor is enough to run almost all 2D games, more recent systems and particularly systems with 3D graphics can be unplayably slow even on the fastest computers. MAME does not currently take advantage of hardware acceleration to speed up the rendering of 3D graphics, in part because of the lack of a stable cross-platform 3D API, and in part because software rendering can in theory be an exact reproduction of the various custom 3D rendering approaches that were used in the arcade games.

Owning and distributing MAME itself is legal in most countries, as it is merely an emulator. Companies such as Sony have attempted in court to prevent other software such as Virtual Game Station, a Sony Playstation emulator from being sold, but they have been ultimately unsuccessful. MAME itself has thus far not been the subject of any court cases. Early coverage of MAME tended to be sensationalist, such as IGN highlighting the use of MAME among console pirates.

Most arcade games are still covered by copyright. Downloading or distributing copyrighted ROMs without permission from copyright holders is almost always a violation of copyright laws. However, some countries (including the US) allow the owner of a board to transfer data contained in its ROM chips to a personal computer or other device they own. Some copyright holders have explored making arcade game ROMs available to the public through licensing. For example, in 2003 Atari made MAME-compatible ROMs for 27 of its arcade games available on the internet site Star ROMs. However, by 2006 the ROMs were no longer being sold there. At one point, various Capcom games were sold with the HotRod arcade joystick manufactured by Hanaho, but this arrangement was discontinued as well. Other copyright holders have released games which are no longer commercially viable free of charge to the public under licenses that prohibit commercial use of the games. Many of these games may be downloaded legally from the official MAME web site. The Spanish arcade game developer Gaelco has also released World Rally for non-commercial use on their website.

The MAME community has distanced itself from other groups redistributing ROMs via the internet or physical media, claiming they are blatantly

infringing copyright and harm the project by potentially bringing it into disrepute. Despite this, illegal distributions of ROMs are widespread on the internet.

MAME was formerly distributed under a custom own-written copyleft license, called "MAME license" or "MAME-like license", which was adopted also by other projects, e.g. Visual Pinball. This old "MAME license" ensures the source code availability, while the redistribution in commercial activities is prohibited. Due to this clause, the license is incompatible with the OSI's Open source definition and the FSF's Free software definition. The non-commercial clause was designed to prevent arcade operators from installing MAME cabinets and profiting from the works of the original manufacturers of the games. The ambiguity of the definition "commercial" lead to legal problems with the license. In March 2016 with version 0.172 MAME itself switched to common free and open source software licenses, the BSD and GPL licenses.

MESS

Multi Emulator Super System (MESS) is an emulator for many game consoles and computer systems, based on the MAME core and now a part of MAME. MESS emulates portable and console gaming systems, computer platforms, and calculators. The project strives for accuracy and portability and therefore is not always the fastest emulator for any one particular system. Its accuracy makes it also useful for homebrew game development.

As of April 2015 MESS supported 994 unique systems with 2,106 total system variations. However, not all of the systems in MESS are functional; some are marked as non-working or are in development. MESS was first released in 1998 and has been under constant development since.

MAME and MESS were once separate applications, but were later developed and released together from a single source repository. MAMEDEV member David Haywood maintained and distributed UME (Universal Machine Emulator) which combined much of the functionality of MAME and MESS in a single application. More recently, on May 27, 2015, MESS was formally integrated with MAME and became a part of MAME.

MESS was distributed under the MAME Licence, which allowed for the redistribution of binary files and source code, either modified or unmodified, but disallowed selling MESS or using it commercially. The license is similar to other copyleft licenses in requiring that rights and obligations provided in the license must be remain intact when MESS or derivative works are distributed.

In addition to the MESS Licence, The MESS Team required that: "MESS must be distributed only in the original archives. You are not allowed to distribute a modified version, nor to remove and/or add files to the archive. Adding one text file to advertise your web site is tolerated only if your site contributes original material to the emulation scene." The MAME license required source code be included with versions of MESS that are modified from the original source, while the MESS legal page states that when distributing binary files "you should also distribute the source code. If you can't do that, you must provide a pointer to a place where the source can be obtained."

While MESS was available in both binary and source code forms, the restrictions on commercial exploitation cause it to fall outside of the Free Software Foundation's definition of free software. Similarly MESS was not considered to be open source software if appraised according to the criteria of the Open Source Definition.

Generally the emulation only includes raw hardware logic, such as for the CPU and RAM, and specialized DSPs such as tone generators or video sprites. The MESS emulator does not include any programming code stored in ROM chips from the emulated computer, since this may be copyrighted software.

Obtaining the ROM data by oneself directly from the hardware being emulated can be extremely difficult, technical, and expensive, since it may require desoldering of integrated circuit chips from the circuit board of the device they own. The desoldered IC is placed into a chip reader device connected to a USB or serial port of another computer, with pin sockets on the reader specifically designed to match the chip package shape in question, to perform a memory dump of the ROM to a data file.

Removal of a soldered chip is often far easier than reinstalling it, especially for extremely small surface mount technology chips, and the emulated device in question may be effectively destroyed beyond recovery after the ROM has been removed for reading.

However, if one has a working system, it is far easier to dump the ROM data to tape, disk, etc. and transfer the data file to one's target machine.

In 2013 the Internet Archive began to provide abandonware games browser-playable via JSMESS (a JavaScript port of the MESS emulator), for instance, the Atari 2600 game E.T. the Extra-Terrestrial.

RetroArch

RetroArch is the reference implementation of the libretro API. It is free, open source, cross-platform software, licensed under the GNU GPLv3.

It is described as a front-end for emulators, game engines, video games, media players and other applications, designed to be fast, lightweight, portable and without dependencies.

RetroArch runs programs converted into dynamic libraries called libretro cores, using several user interfaces such as command-line interface, a few graphical user interfaces (GUI) optimized for gamepads (the most famous one being called XMB, a clone of Sony's XMB), several input, audio and video drivers, plus other sophisticated features like dynamic rate control, audio filters, multi-pass shaders, netplay, gameplay rewinding, cheats etc.

RetroArch has been ported to many platforms. It can run on several PC operating systems (Windows, OS X, GNU/Linux), home consoles (PlayStation 3 , Xbox 360, Wii U, etc.), handheld consoles (PlayStation Vita, Nintendo 3DS, etc.), on smartphones (Android, iOS, etc.), embedded systems (Raspberry Pi, ODROID, etc.) and even on web browsers by using the Emscripten compiler.

Formerly known as SSNES, initially based on pseudonymous programmer byuu's libretro predecessor libsnes, it began its development in 2010 with Hans-Kristian "themaister" Arntzen committing the first change on GitHub. It was intended as a replacement to bsnes's Qt-based interface but it grew to support more emulation "cores". On April 21, 2012, SSNES was officially renamed to RetroArch to reflect this change in direction.

On February 16, 2016, RetroArch became one of the first ever applications to implement support for the Vulkan graphics API, having done so on the same day of the API's official release day.

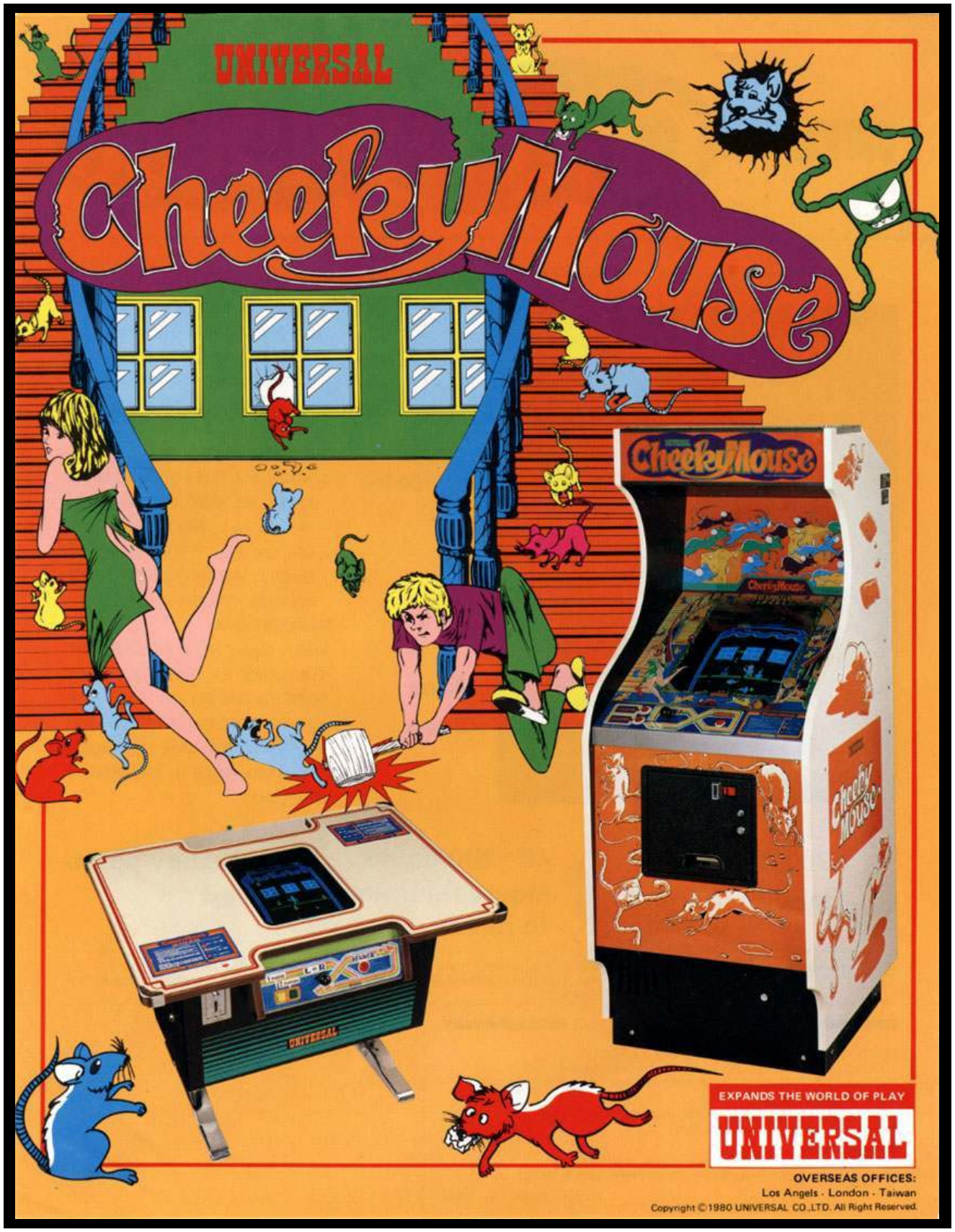
On November 27, 2016, the Libretro Team announced that, alongside Lakka (LibreELEC-based RetroArch operating system), RetroArch would be on the Patreon crowdfunding platform to allow providing bounties for developers who fix specific software bugs and to cover the costs for matchmaking servers.

On December, 2016, GoGames - a company contracted by video game developer and publisher Sega - approached the RetroArch developers with the intention of using their software in their SEGA Forever project but ultimately the cooperation didn't come to fruition due to licensing disagreements.

Its major features include:
- Advanced GPU shader support - A multi-pass post-processing shader pipeline allows efficient use of image scaling algorithms, emulation of complex CRT, NTSC video artifacts and other effects;
- Dynamic Rate Control to synchronize video and audio while smoothing out timing imperfections;
- FFmpeg recording - Built-in support for lossless video recording using FFmpeg's libavcodec;
- Gamepad abstraction layer called Retropad.
- Gamepad auto-configuration - Zero-configuration needed from the user after plugging a gamepad in;
- Peer-to-peer netplay that uses a rollback technique similar to GGPO;
- Audio DSP plugins like an equalizer, reverb and other effects;
- Advanced savestate features - Automatic savestate loading, disabling SRAM overwritting, etc.;
- Frame-by-frame gameplay rewinding at the press of a button;
- Button overlays for touchscreen devices like smartphones;
- Thumbnails of game boxarts;
- Low input and audio lag options;
- Automatically build categorized playlists by scanning directories for games/ROMs;
- Multiple interfaces including: CLI, XMB (optimized for gamepads), GLUI/MaterialUI (optimized for touch devices) and RGUI (available everywhere);
- ROM/ISO scanner able to create playlists.
- Libretro database of cores, games, cheats, etc.
- OpenGL and Vulkan API support.

RetroArch can run any libretro core. While RetroArch is available for many platforms, the availability of a specific core varies per platform.

RetroArch has been praised for the number of systems and games it can play under a single interface. It has been criticized for how hard it is to set up, due to the extensive number of options available to the user and at the same time praised for the more advanced features it possesses. On the PC, some users feel like it is better controlled by a gamepad than a mouse and keyboard.



The International Arcade Museum®

and Killer List of Videogames at Museum of the Game

• Used a lot, for both pictures, info, and as a database from what I base this book on.

This is the main place I use for info for this book. I use their "killer-list" as a base for the arcade machines release date. Their information may be incorrect on several things, but I found this place was the most comprehensive and detailed place to use information from.

https://www.arcade-museum.com/

Most of the information in this book comes either from flyers, manuals and wikipedia. If I have used another source, a credit will be shown at the bottom of the text.

These are web sites that i use alot for pictures/screenshots, reference and much of the information. I can recommend all of these websites, as they are very informative and fun to look through.
If you are the owner of one of these sites and feel that i have done you wrong, then please send me an e-mail and I will make the necessary change to your wish.

The Golden Age Arcade Historian

The Golden Age Historian

"A blog dedicated to the history of arcade video games from the bronze and golden ages (1971-1984)"

• Used for info and pictures.

An extremely well made, researched and interesting blog on coin-op machines and the history regarding them. A very big recommendation on visiting this site.

http://allincolorforaquarter.blogspot.no/

PHOENIX VIDEO GAME CLASSICS

• Used for a few pictures and info.

A personal website by a video game collector. The site include different faqs, homebrew games (?) and a collection site.

http://www.ccjvq.com/slydc/

SYSTEM 16

"The Arcade Museum. Detailed Hardware information on Arcade Hardware and Systems"

• Used for most of the hardware info and pictures. Some info on arcades.

A giant and detailed site on coin-op arcade machines and their hardware.

http://www.system16.com/

The Arcade Flyer Archive

The Arcade Flyer Archive

"The Arcade Flyer Archive (TAFA) is a digital repository for advertisement flyers that are used by the coin-operated amusement industry to promote the sales of its games. "

• Used for pictures

A giant site including absurd amount of adverts and flyers. I really recommend a look through this superb site!

https://flyers.arcade-museum.com/

GAMING HISTORY

"A gaming database featuring all coin-op, arcade games, slot machines, home video games and more..."

• Used for info.

A database on different video games, including coin-op games.

https://www.arcade-history.com/

EMULAB

"The purpose of this wiki and website is to be a repository of links and information for all arcade games for which there are no known ROM dump, due to the lack of original boards from which to obtain the necessary information. "

• Used for some info on the Undumped Wiki.

https://www.emulab.it/index.

VGMRIPS

"Welcome to VGMRips, The biggest and most active site for retro Video Game Music rips"

• Used for a some info.

A website detailing music and sound included on different video games.

http://vgmrips.net/wiki/Main_Page

RALLY

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THE AUSTRALIAN MADE T.V. TABLE TENNIS GAME
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ADK

Founded	*July 1980 (as Alpha Denshi)* *1993 (as ADK)*
Defunct	*2003*
Fate	*Closed, properties sold*
Successor	*SNK Corporation*
Headquarters	*Ageo, Saitama, Japan*

ADK Corporation was a Japanese video game production company throughout the 1980s and 90s. ADK began as a developer of arcade games but is best known for their library of Neo Geo titles, mainly produced in the 1990s in partnership with SNK.

ADK was founded in July 1980 in Ageo, Saitama, Japan. At the time, it was known as Alpha Denshi or Alpha for short. Originally a producer of audio and telecommunications equipment, Alpha first ventured into video games in 1980 with two arcade titles: Dorachan by Craul Denshi and Tehkan's Shogi, a basic Japanese chess game. Dorachan was recalled shortly after release due to unlicensed usage of the fictional character Doraemon.

Despite an inauspicious start, Alpha continued to develop arcade games in 1981. Janputer, published by Sanritsu Giken, was one of the earliest arcade Mahjong titles and helped Alpha to establish themselves in the industry. In 1983, Alpha expanded into sports games with their self-published Exciting Soccer and two Champion Baseball titles for Sega. Alpha would produce several more games for Sega through the mid 1980s while continuing to publish others on their own.

Alpha Denshi began developing games almost exclusively for SNK hardware in 1987. In 1990, SNK was developing a new unified video game platform for both the home and arcades.

In 2000, ADK released its last video game title, Dynamite Slugger, and was primarily focused on developing content for Japanese i-mode-based mobile devices. After their bankruptcy, SNK Playmore bought up ADK's relinquished intellectual properties. To this day, ADK characters are still known to occasionally appear in SNK Playmore games.

American Laser Games

Type	*Private*
Founded	*1989*
Founder	*Robert Grebe*
Fate	*Bought out by Her Interactive*
Headquarters	*Albuquerque, New Mexico*

American Laser Games was a company based in Albuquerque, New Mexico that created numerous light gun laserdisc video games featuring live action full motion video.

The company was founded in the late 1980s by Robert Grebe, who had originally created a system to train police officers under the company name ICAT (Institute for Combat Arms and Tactics) and later adapted the technology for arcade games. Its first hit game was Mad Dog McCree, a light gun shooter set in the American Old West. By mid-1995 they were recognized as the leading company in the medium of laserdisc-based arcade games. Almost all arcade games released by the company were light gun shooters and a number of them also had an Old West theme.

Later, the company turned toward compact disc technology to release its games. Ports of its arcade titles were released for the Sega CD, CD-i and DOS computers equipped with CD-ROM drives. The company was particularly supportive of the 3DO, not only releasing versions of its games for the console, but also offering a modified version of the 3DO platform as an upgrade kit for existing arcade video game cabinets, supporting compressed video versions of their games at a lower cost. In 1995, American Laser Games released Mazer for the 3DO home market and Orbatak (3DO-powered) for the arcade - their first and only in-house non-Full motion video based games.

American Laser Games lasted until the mid-to-late 1990s, by which time it had begun making "games for girls" for the PC under the moniker Her Interactive, beginning with McKenzie & Co. The company eventually closed its doors and was bought out by Her Interactive.

Atari, Inc.

Founded	*July 26, 1972*
Founders	*Nolan Bushnell* *Ted Dabney*
Defunct	*July 1, 1984; 33 years ago*
Fate	*Closed, properties sold*
Successor	*Atari Corporation, Atari Games*
Headquarters	*Sunnyvale, California, United States*

Atari, Inc. was an American video game developer and home computer company founded in 1972 by Nolan Bushnell and Ted Dabney. Primarily responsible for the formation of the video arcade and modern video game industries, the company was closed and its assets split in 1984 as a direct result of the North American video game crash of 1983.

Atari was named after Japan's centuries old classic, Go. The term "atari" is used by Go players to politely inform their opponent that they are about to be overrun. The company was created in 1972 with money earned by Bushnell's first game Computer Space. While this initial game was not considered to be a success financially, it seeded the ideas for the game Pong, which would become the first gaming classic the gaming industry would see. By most gaming historians, this is considered to be the true birth of the gaming industry.

Several financial problems would eventually lead to the sale of Atari to Warner Communications in 1976 for $28 - $32 Million (est .).

In 1977 Atari was able to release what would become their lasting legacy, the Atari 2600.

In July of 1984, a $240 million deal was struck between Atari and ex-head of Commodore, Jack Tramiel, and all of Atari was sold except for the small coin-operated arcade business, Ataritel. Warner retained the arcade division, continuing it under the name Atari Games and eventually selling it to Namco in 1985. Warner also sold Ataritel to Mitsubishi.

Atari would eventually be renamed Atari Corporation and would never be able to regain control of the console market, or have the same amount of clout that they had during the peak of the 2600's popularity.

"giantbomb.com"

Atlus

Type	*Kabushiki gaisha*
	Subsidiary
Founded	*April 7, 1986 (Atlus Co., Ltd.)*
	September 5, 2013 (Sega Dream Corp.)
Headquarters	*Setagaya, Tokyo, Japan*
Parent	Sega
Employees	210 (2017)

Atlus Co., Ltd. is a Japanese video game developer, publisher and distribution company based in Tokyo, and a subsidiary of Sega. It is best known for developing the Megami Tensei, Persona, Etrian Odyssey and Trauma Center series.

Atlus began in April 7, 1986 as a video game developer of computer games for other companies. In January 1987, Atlus started selling amusement equipment. It expanded into the sale of karaoke equipment in March 1989. Atlus released the first video game under its own name in 1989: Puzzle Boy for the Game Boy.

Atlus started in the arcade industry in the 1990s by manufacturing its first arcade video game, BlaZeon, in 1992. In 1995, Atlus launched Print Club Arcades in partnership with Sega. In its goal to further increase its presence in the amusement industry, Atlus acquired the manufacturer Apies from Yubis Corporation in 1999. Atlus suffered from deficit financial results in both 1999 and 2000. To address the issue, Atlus established a management reform plan in 2001. In its restructuring efforts, Atlus sold two subsidiaries (one of them being Apies) to their respective employees as part of a management buyout.

On 30 August 2010, Index Holdings announced its merger with Atlus. Although fans were concerned about the company's future, CEO Shinichi Suzuki said that Atlus would continue to provide the "finest quality game experiences possible" and the merger "further strengthens the foundation of Atlus, both in Japan and here in the United States." After the dissolution, the name Atlus continued as a brand used by Index Corporation for video game publishing until 2013. Atlus in its current incarnation was founded as Sega Dream Corporation in September 2013, a new shell corporation established by Sega.

Bally Manufacturing

Founded	*January 10, 1932*
Founder	*Raymond Moloney*
Defunct	*1995*
Fate	*Acquired by Hilton*
Headquarters	*Chicago*
Industry	*Interactive entertainment*

Bally Manufacturing, later renamed Bally Entertainment, was an American company that began as a pinball and slot machine manufacturer, and later expanded into casinos, video games, health clubs, and theme parks. It was acquired by Hilton Hotels in 1995. Its brand name is still used by several businesses previously linked to Bally Manufacturing, most notably Bally Technologies.

The Bally Manufacturing Corporation was founded by Raymond Moloney on January 10, 1932, when Bally's original parent, Lion Manufacturing, established the company to make pinball games. The company took its name from its first game, Ballyhoo.

Throughout the 1960s, Bally continued to dominate the slot machine industry, cornering over 90% of the worldwide market by the end of the decade. In the late 1960s, Bally became a publicly traded company and made several acquisitions, one being Midway Manufacturing, an amusement game company from Schiller Park, Illinois.

During the 1970s and early 1980s, Midway became a primary source of income for Bally as it became an early arcade video game maker and obtained the licenses for three of the most popular video games of all time: Space Invaders, Pac-Man and Ms. Pac-Man. Also in the late 1970s, Bally made an entry into the growing market for home computer games. The Bally Professional Arcade, as the machine was called, had advanced features for the time. These included a palette of 256 colors and the ability to play 4-voice music.

In 1995, Bally Entertainment was purchased by Hilton Hotels Corporation. Later the casino resorts division of Hilton Hotels became Park Place Entertainment, (later Caesars Entertainment) and in 2005 was acquired by Harrah's Entertainment.

Banpresto

Type	*Kabushiki gaisha*
	Subsidiary
Founded	*April 1977*
	April 1, 2008 (B.B. Studio)
Headquarters	*Shinagawa, Tokyo, Japan*
Parent	*Bandai Namco Holdings*

Banpresto Co., Ltd. is a Japanese toy company, and a former game developer and publishing, headquartered in the Shinagawa Seaside West Building in Shinagawa, Tokyo. The current iteration of the company was formed on April 1, 2008, with the focus on the toy consumer business.

The original company was founded April 1977 as Hoei Sangyo, Co. Ltd.. During the 1980s it worked mainly as a subcontractor for Sega and its arcade division, and the company was renamed Coreland in 1982. It started to be partially owned by Bandai in 1989, when it gained its current name. It became a wholly owned subsidiary of Bandai Namco Holdings in March 2006.

Banpresto has created a variety of Japan-only video games, most notably the Super Robot Wars series. Other projects include anime tie-in games such as the Slam Dunk basketball games and Tenchi Muyou! Game Hen. Banpresto also made the Another Century's Episode series, a collaboration with FromSoftware, and the Compati Hero series of games which crosses over the Ultraman, Kamen Rider and Gundam franchises. Banpresto also makes several varieties of mechanical prize-winning games. As Coreland, the company has produced a number of games for Sega, including Pengo, 4-D Warriors and I'm Sorry.

Banpresto's video game operations were absorbed into Bandai Namco Games on April 1, 2008. As part of the merger, two of Banpresto's subsidiaries, Pleasure Cast Co. Ltd and Hanayashiki Co. Ltd, became Namco subsidiaries. Banpresto itself now focuses on its prize machines business.

Capcom

Founded	*May 30, 1979*
Founder	*Kenzo Tsujimoto*
Owner	*Tsujimoto family*
Headquarters	*Chūō-ku, Osaka, Japan*
Revenue	*Increase $239.6 million (2014)*
Employees	*2,811 (2017)*

Capcom Co., Ltd. is a Japanese video game developer and publisher known for creating multi-million-selling franchises such as Mega Man, Street Fighter, Resident Evil, Devil May Cry, Ace Attorney, and Monster Hunter as well as games based on the Disney animated properties. Established in 1979, it has become an international enterprise with subsidiaries in North America, Europe, and East Asia.

The original companies that spawned Capcom's Japanese branch were I.R.M Corporation as well as its subsidiary Japan Capsule Computers Co., Ltd., both of which were devoted to the manufacturing and distribution of electronic game machines. The name Capcom is a clipped compound of "Capsule Computers", a term coined by the company to describe the arcade machines it solely manufactured in its early years, designed to set themselves apart from personal computers that were becoming widespread at that time. The word capsule alludes to how Capcom likened its game software to "a capsule packed to the brim with gaming fun", as well as to the company's desire to protect its intellectual property with a hard outer shell, preventing illegal copies and inferior imitations.

In the first few years after its establishment, the Japanese branch of Capcom had three development groups referred to as "Planning Rooms", led by Tokuro Fujiwara, Takashi Nishiyama and Yoshiki Okamoto, respectively. Later, games developed internally used to be created by several numbered "Production Studios", each assigned to different games. Starting in 2002, the development process was reformed to better share technologies and expertise, and all of the individual studios were gradually restructured into bigger departments responsible for different tasks.

CAVE

Founded	*June 15, 1994*
Headquarters	*Shinjuku, Tokyo, Japan*
Total assets	*JP¥ 874,251,193 (2012)*
Employees	*158 (2012)*
Subsidiaries	
	Beads Mania (merged on June 1, 2008)
	Mini4WD Networks Co., Ltd. (44.8% stake)

CAVE Interactive CO., acronym for "Computer Art Visual Entertainment", is a Japanese video game company founded in 1994 by former employees of Toaplan following its bankruptcy. They are known primarily for their "bullet hell" shoot 'em ups; from 1995 up to 2010, CAVE was one of the most prolific shoot 'em up developers in the Japanese market. Alongside this, CAVE has produced a variety of other types games for arcades, home consoles, PCs, and smartphones, also dating back to 1995.

Key staff members include Tsuneki Ikeda (director and COO) and Makoto Asada (game development department head) who left the company in 2013. On January 24, 2014, community manager "Masa-King" announced that the Cave-World Twitter and blog were shutting down on February 28, 2014, terminating all existing English social media presence in the west.

CAVE's arcade titles have used various arcade boards over the years. Earlier titles used a CAVE-designed board based on a Motorola 68000 CPU, with later releases moving over to the PGM (Poly Game Master) hardware, and then, starting with Mushihimesama, onto boards based on the Hitachi SH-3 CPU. CAVE dabbled in PC-based hardware for Deathsmiles II, but switched back to SH-3 for later titles.

Since 2006, CAVE has hosted CAVE Matsuri, a yearly festival in which several announcements regarding company affairs are made. Also, some titles are offered exclusively at this event such as Mushihimesama Cave Matsuri ver 1.5.

Within the Guinness World Records, Cave holds the record for the "most prolific developer of danmaku shooters", having released 48 games in the genre since 1995 as of October 2010.

Chicago Coin

Founded	*1931*
Founder	*Samuel H. Gensburg*
Defunct	*1977*

Chicago Coin was one of the early major manufacturers of pinball tables to operate in the coin-operated amusement industry.

Sam Gensburg founded Chicago Dynamic Industries after a stint as the co-founder of Chicago Coin Machine Exchange with brother-in-law Sam Wolberg and third partner Lou Koren, a company which had a business of trade-ins for coin-operated games. In 1931, Sam Genburg's brothers Louis Gensburg, David Gensburg, and Meyer Gensburg had founded Genco as an amusement manufacturer and Sam decided to enter that business by establishing Chicago Dynamic Industries with the label Chicago Coin to use on its products. The company started off by making replacement boards for early pinball games before creating the table Blackstone (1933) which was manufactured by a partner named Stoner.

Though never a technologically-driven or innovative company, Chicago Coin was highly successful in the years preceding and immediately succeeding World War II. Their pinball table Beam-Lite (1935) which featured a lighted playfield sold 5,703 units and their flipperless game Kilroy (1947) sold 8,800 units which was the highest selling pinball table up until the 1970s. The company also diversified in later years, creating sports tables and shuffle alleys.

In 1973, Chicago Coin was one of the many companies who created Pong clones with TV Ping Pong. In subsequent years, the company took to licensing games from other manufacturers.

Following subsequent financial trouble, Chicago Dynamic Industries sold the assets of Chicago Coin which were incorporated into the new company Stern Electronics, Inc.

Cinematronics

Founded	*1975*
Founders	*Jim Pearce*
	Dennis Parte
	Gary Garrison
Defunct	*1987*
Fate	*Purchased by Tradewest*
Successor	*Leland Corp.*

Cinematronics Incorporated was a pioneering arcade game developer that had its heyday in the era of vector display games. While other companies released games based on raster displays, early in their history, Cinematronics and Atari released vector-display games, which offered a distinctive look and a greater graphic capability (at the time), at the cost of being only black and white (initially).

Cinematronics Inc. was founded in 1975 by Jim Pearce, Dennis Parte and Gary Garrison in El Cajon, California, although early on Parte and Garrison sold their shares to Tom "Papa" Stroud. Cinematronics' first games, a Pong clone, a Flipper Ball copy and their first original game design, Embargo, were released in 1975, 1976, and 1977, but they were not particularly notable. The company really began to prosper after the Space Wars game came into production about a year later.

Space Wars was the first arcade game to utilize black & white vector graphics, which enabled it to display sharp, crisp images. Space Wars had graphics which were far more detailed than the raster displays of the time. Cinematronics shipped over 30,000 units and was a top seller in 1978.

In 1982, Cinematronics started releasing games which used raster display, such as Naughty Boy and Zzyzzyxx. During this time Cinematronics filed for Chapter 11 bankruptcy protection.

In 1983 Cinematronics released Dragon's Lair, one of the first laserdisc-based arcade games.

In 1987, Cinematronics was acquired by Tradewest and renamed the Leland Corporation and continued to make arcade and PC game software. Tradewest was bought out by WMS in 1994 to become their console division.

Data East

Founded	*April 20, 1976*
Founder	*Tetsuo Fukuda*
Defunct	*June 25, 2003*
Fate	*Bankruptcy*
Headquarters	*Suginami, Tokyo, Japan*
Total equity	*¥282.5 million (2001)*

Data East Corporation, also abbreviated as DECO, was a Japanese video game and electronic engineering company. The company was in operation from 1976 to 2003, and released 150 video game titles.

Data East was founded on April 20, 1976 by Tokai University alumnus Tetsuo Fukuda. Data East developed and released in July 1977 its first arcade game Jack Lot, a medal game based on Blackjack for business use. This was followed in January 1978 by Super Break which was its first actual video game. More than 15 arcade games were released by Data East in the 1970s.

Data East established a U.S. division in 1979, after its chief competitors Sega and Taito had already established a market presence. In 1980, Data East published Astro Fighter which became its first major arcade title. While making games, Data East released a series of interchangeable systems compatible with its arcade games, notably the DECO Cassette System which soon became infamous among users due to technical problems. Data East dropped the DECO Cassette by 1985.

Data East continued to release arcade video games over the next 15 years following the video game crash of 1983. Some of its most famous coin-op arcade games from its 1980s heyday included Karate Champ, Heavy Barrel, BurgerTime, Bump 'n' Jump, Karnov and Atomic Runner Chelnov.

In 1981, three staff members of Data East founded Technōs Japan, who then supported Data East for a while before becoming completely independent.

Most of Data East's intellectual properties were acquired in February 2004 by G-Mode, a Japanese mobile game content provider.

Enix

Type	*Kabushiki gaisha*
Founded	*September 22, 1975*
Founder	*Yasuhiro Fukushima (Active CEO)*
Fate	*Merged with Square*
Successor	*Square Enix*
Headquarters	*Shibuya, Tokyo, Japan*
Employees	134 (2002)

Enix Corporation was a Japanese video game publisher that produced video games, anime and manga. Enix is known for publishing the Dragon Quest series of role-playing video games.

Enix was founded on September 22, 1975 as Eidansha Boshu Service Center by Japanese architect-turned-entrepreneur Yasuhiro Fukushima. The company initially published tabloids that advertised real estate.

In February 1980, Eidansha Boshu Service created a wholly owned subsidiary for the purpose of specializing in real estate trading and brokerage. This new subsidiary would take on the name of Eidansha Systems in August 1981. The following year, in August 1982, Eidansha Systems was renamed Enix Corporation. The name "Enix" is a play on the words "phoenix", a mythical bird that is reborn from its own ashes, and "ENIAC", the world's first digital computer.

After a failed attempt of Eidansha Boshu Service to go nationwide in 1982, its newly established Enix subsidiary began a foray into the gaming market by holding a personal computer game programming contest. One of the winners was Love Match Tennis, created by Yuji Horii. It would go to become one of the company's first PC releases. Another winner was the puzzle game Door Door by Koichi Nakamura, which would become one of the company's better known home computer titles. Nakamura would stay on board as one Enix's key programmers.

The company merged with its competitor Square in 2003 to form Square Enix, in order to mutually decrease development costs and to compete with foreign developers.

Exidy

Founded *1974*
Founder *H.R. “Pete” Kauffman*

Exidy was one of the largest creators of arcade video games during the early period of video games, from 1974 until at least 1986 (when Chiller was released). The company was founded by H.R. “Pete” Kauffman. The name “Exidy” was a portmanteau of the words “Excellence in Dynamics.”

Exidy found competing with larger video game companies such as Atari, Inc. difficult. The company’s Lila Zinter claimed in 1983 that “Exidy is an innovator, but ... we have a hard time breaking through the politics of getting a game a fair chance.”

One of Exidy’s efforts aimed at trivia lovers during the 1980s was the quiz game Fax, a multi-level game housed in a large wooden cabinet that stood about 4 feet high and looked nothing like other video games of the time period. Much like the 2000s game show, Who Wants to Be a Millionaire?, players were shown a series of questions with four possible answers. A point value “clock” ran down to zero after answers were shown, meaning players answering quicker earned more points for their correct answers.

Beginning in 1983, Exidy released a series of light gun games, the first and most well known of which was Crossbow. These games were also the first to feature fully digitized sound for all sound effects and music. Other “C” series games include Cheyenne, Combat, Crackshot, Clay Pigeon and Chiller. Chief designer for these games was Larry Hutcherson. Exidy also made two rarely seen motion cabinet games with vector graphics called Vertigo and Top Gunner.

In 2006, it was announced that Mean Hamster Software acquired rights to develop new Exidy arcade games.

In 2015, CollectorVision Games acquired rights to the Exidy name and logo.

G.rev

Type *Yūgen gaisha*
Headquarters *Japan*
Products *Arcade shoot ‘em ups*
Website *grev.co.jp*

G.rev Ltd. , short for G.revolution, is a Japanese video game developer. The company was founded by former employees of Taito’s arcade division who had worked on G-Darius and RayStorm, and is known primarily for their arcade shoot ‘em up games.

G.rev was founded with the mission of developing arcade shooters, but they realized the cost of development was more than their initial investment capital. To generate revenue, they took on contract work for Taito and Treasure, co-developing the popular shooter Ikaruga with the latter. This relationship would remain fruitful, with G.rev assisting again on Gradius V, and Ikaruga director Hiroshi Iuchi assisting on G.rev’s own Strania. G.rev’s first independent release was a puzzle game, Doki Doki Idol Star Seeker, a Mine Sweeper-like arcade puzzle game, created with low investment and high returns in mind.

With the money in place to develop a full-fledged arcade shooter on their own, the team, under direction of president Hiroyuki Maruyama, set out to develop Border Down a spiritual successor to the Taito arcade classic Metal Black. Border Down was met with wide acclaim among shooter fans following the release of its Dreamcast port, with particular praise paid to its unique beam mechanics and “border system”

Later, G.rev chose to develop for the Taito X2 hardware, allowing the graphical quality of the arcade version to match the later Xbox 360 port.

G.rev continued to develop on the Taito X2 hardware, releasing Strania: The Stella Machina, a vertically scrolling shooter. For the first time, G.rev decided to forgo a retail release, instead releasing at Xbox Live Arcade.

General Computer Corporation

Founded *1981*
Founder *Doug Macrae*
John Tylko
Kevin Curran
Headquarters *Massachusetts, United States*
Website *gccprinters.com*

The General Computer Corporation (GCC) is a printer company formed in 1981 by Doug Macrae, John Tylko, and Kevin Curran. The company began as a video game company. They later changed to make computer peripherals.

They started out making mod-kits for existing arcade games - for example Super Missile Attack, which was sold as an enhancement board to Atari’s Missile Command. At first Atari sued, but ultimately dropped the suit and hired GCC to develop games for Atari (and stop making enhancement boards for Atari’s games without permission). They created an enhancement kit for Pac-Man called Crazy Otto which they sold to Midway, who in turn sold it as the sequel Ms. Pac-Man; they also developed Jr. Pac-Man, that game’s successor.

Under Atari, Inc., GCC made the original arcade games Food Fight, Quantum, and the unreleased Nightmare; developed the Atari 2600 versions of Ms. Pac-Man and Centipede; produced over half of the Atari 5200 cartridges; and developed the chip design for the Atari 7800, plus the first round of cartridges for that base unit.

In 1984, the company changed direction to make peripherals for Macintosh computers: the HyperDrive (the Mac’s first internal hard drive), the WideWriter 360 large format inkjet printer, and the Personal Laser Printer (the first QuickDraw laser printer).

HyperDrive was unusual because the original Macintosh did not have any internal interface for hard disks. It was attached directly to the CPU, and ran about seven times faster than Apple’s “Hard Disk 20”.

Presently the company focuses exclusively on laser printers.

Genki

Type	*Kabushiki gaisha*
Founded	*October 16, 1990 (original company)*
	February 26, 2008 (current company)
Headquarters	*Nakano, Tokyo*
Key people	*Hiroshi Hamagaki (President)*
Website	*www.genki.co.jp (en)*

Genki Co., Ltd. is a Japanese developer of computer and video games. It was founded in October 1990 by Hiroshi Hamagaki and Tomo Kimura, who left Sega to form the company. The company is best known for its racing game titles. According to MobyGames, the company logo is a picture of Hiroshi Hamagaki, drawn by his son when he was 3 years old.

In its early years, Genki dabbled in a few different genres, looking for its niche. On one end of the spectrum, there was Devilish, a game similar to Arkanoid that was released for Sega's Game Gear and Mega Drive systems in 1991. On the other end, there was Kileak: The DNA Imperative, a first-person mecha shooting game for the PlayStation which was released in 1995.

Genki found its niche in 1994 with the release of Shutokō Battle '94 Keichii Tsuchiya Drift King for the SNES—the first in a long-running series of racing games. Shutokou Battle 2 followed one year later, in 1995, and was also for the SNES.

Within the same year, Genki shifted towards developing 3D games, continuing the Shutokou Battle series with Highway 2000 on the Sega Saturn. Genki also produced major titles for both the PlayStation and Nintendo 64 consoles in the following two years.

In 2010, Genki created an alternate reality game division called Genki ARG, to replace the currently discontinued Genki Racing Project. This division was closed in late of March 2012.

The Shutokou Battle series was recently revived with a Mobage version for mobile phones released in 2017. This is the first Shutokou Battle game after GRP was discontinued. The same year, however, Genki announced that they were discontinuing the service, to be shut down in late of that year.

Gottlieb

Founded	*Chicago, Illinois (1927)*
Founder	*David Gottlieb*
Defunct	*1996*
Successor	*Gottlieb Development LLC*
Headquarters	*Chicago, Illinois, United States*

Gottlieb (formerly D. Gottlieb & Co.) was an American arcade game corporation based in Chicago, Illinois. The company was initially producing pinball machines while later expanding into various other games including pitch-and-bats, bowling games, and eventually video arcade games (notably Reactor and Q*bert and, leading to the demise of Mylstar; M*A*C*H*3).

Like other manufacturers, Gottlieb first made mechanical pinball machines, including the first successful coin-operated pinball machine Baffle Ball in 1930. The 1947 development of player-actuated, solenoid-driven 2-inch bats called "flippers" revolutionized the industry. Players now had the ability to shoot the ball back up the playfield and get more points. The flippers first appeared on a Gottlieb game called "Humpty Dumpty", designed by Harry Mabs. By this time, the games also became noted for their artwork by Roy Parker. By the 1970s the company had begun designing their games with longer 3-inch flippers, now the industry standard.

Gottlieb was bought by Columbia Pictures in 1976. In 1983, after the Coca-Cola Company had acquired Columbia, Gottlieb was renamed to Mylstar Electronics, but this proved to be short-lived. By 1984 the video game industry in North America was in the middle of a shakeout and Columbia closed down Mylstar at the end of September 1984. A management group, led by Gilbert G. Pollock, purchased Mylstar's pinball assets in October 1984 and continued the manufacture of pinball machines under a new company, Premier Technology. As a result of this a number of prototype Mylstar arcade games, which were not purchased by the investors, were never released. Premier did go on to produce one last arcade game, 1989's Exterminator.

Gremlin Industries

Founded	*1971*
Founder	*Frank Fogleman*
	Carl Grindle
Defunct	*1983*
Fate	*Folded into Bally Manufacturing*
Headquarters	*San Diego, California*

Gremlin Industries was an arcade game manufacturer active from the 1971 to 1983 based San Diego, California, USA.

Gremlin was founded in 1971 as a contract engineering firm by Harry Frank Fogleman and Carl E Grindle. In 1973 they became a manufacturer of coin-operated wall games with their first game Play Ball (1973). Gremlin joined the video game market in 1976 by releasing its first video arcade game entitled Blockade (1976).

In 1978, Gremlin was acquired by Sega Enterprises Inc. and their games acquired the label of Gremlin/Sega or Sega/Gremlin. Following the Sega purchase, Gremlin began to release games from both Sega and other Japanese companies. Among these video games were Namco's Gee Bee (1978) and Konami's Frogger (1981).

In 1982 the name of the company was changed to Sega Electronics to better strengthen the Sega brand name in the United States. In mid-1983 the arcade assets of the company were sold to Bally Manufacturing and Sega Electronics was shuttered soon afterwards.

The company still exists as Ages Electronics under CBS.

Sega released emulated and playable versions of some of the early Sega/Gremlin arcade games as vault material for the Sega Genesis Collection for the PlayStation 2 and PlayStation Portable.

Hudson Soft

Founded	*May 18, 1973*
Founders	*Yuji Kudo*
	Hiroshi Kudo
Defunct	*March 1, 2012*
Fate	*Merged into Konami Digital Ent.*
Parent	*Konami*
Employees	*421 (2011)*

Hudson Soft Co., Ltd, commonly known by its brand name Hudson, was a Japanese video game company that released numerous games for video game consoles, home computers and mobile phones, mainly from the 1980s to the 2000s. It was headquartered in the Midtown Tower in Tokyo Midtown, Akasaka, Minato, Tokyo, Japan, with an additional office in the Hudson Building in Sapporo.

Hudson Soft was founded in Toyohira-ku, Sapporo, Japan on May 18, 1973 by brothers Yuji and Hiroshi Kudo. The founders grew up admiring trains, and named the business after their favorite, the Hudson locomotives (called the "4-6-4", and especially Japanese C62). Initially, it dealt with personal computer products, but later expanded to the development and publishing of video games, mobile content, video game peripherals and music recording. Primarily a video game publisher, it internally developed many of the video games it published, as well as a few published by other companies. It is known for series such as Bomberman, Adventure Island, Bloody Roar, and Bonk.

Hudson Soft made the TurboGrafx-16 in association with NEC, to compete against Nintendo, Sega, and SNK, while continuing making games on other platforms, as a second-party developer.

Hudson Soft ceased to exist as a company on March 1, 2012, and merged with Konami Digital Entertainment who was the surviving entity. Despite the demise of Hudson Soft, Konami had intended for products and services to continue being developed and offered under the Hudson brand. The Hudson website was even initially retained and maintained by Konami. In practice, however, there was no significant action from Konami with the Hudson brand, save for some re-releases on the Virtual Console.

Incredible Technologies

Type	*Private*
Founded	*1985*
Founder	*Elaine Hodgson (President & CEO)*
	Richard Ditton (Executive VP)
Headquarters	*Vernon Hills, Illinois, United States*
Employees	*200 (2017)*

Incredible Technologies (IT), based in Vernon Hills, Illinois, is a US-based designer and manufacturer of coin-operated video games and Class III casino games, best known for the Golden Tee Golf series. The company employs over 200 people at its suburban Chicago campus.

Founded in July 1985 by Richard Ditton, a NASA software engineer, and Elaine Hodgson, a biochemist, IT began as a software design gaming firm. The company started in the basement of the owners' home and focused on a wide variety of work-for-hire entertainment projects, including pinball hardware and game programming for Data East. In its early years, IT struggled to maintain profitability without a solid hit.

In 1988 IT developed hardware and software for its first coin-operated video game Capcom Bowling, which used a trackball to simulate the movement of a bowler's toss. A dozen more titles followed in the 1990s under the brand name Strata Games.

In September 1989 at the Amusement and Music Operators Association (AMOA) International Expo the company launched a golf game titled Golden Tee Golf, which used a trackball much like the bowling game, this time to simulate a golfer's swing. The game slowly built a following throughout the 1990s, and by 1996 IT was producing updates to the game every year. The game celebrated its 20th anniversary in 2009 and IT released a new high definition version of the game in a Showpiece cabinet.

In the face of declining coin-operated video game sales, IT looked to diversify its product line. The company began researching the improvement of Electronic Gaming Machine (EGM) or Slot Machine technology, and in 2008 released the Magic Touch collection of video slot, poker and keno games.

Irem

Type	*Public*
Founded	*1974 (Irem Corporation)*
	1997 (Irem Software Engineering)
Headquarters	*Chiyoda, Tokyo, Japan*
Key people	*Masaki Ono (President)*
Employees	*259 (March 2016)*
Parent	*Eizo*

Irem is a Japanese video game console developer and publisher, and formerly a developer and manufacturer of arcade games as well.

Irem's ancestor was founded in 1969 by Kenzo Tsujimoto in Osaka Prefecture. Tsujimoto opened his store in Osaka to sell machines for cotton candy stores. At the time, Tsujimoto was already confident in the potential of the game entertainment and started including the manufacturing of pachinko machines to his business as early as 1970.

The success of the store led to the creation in 1974 of IPM Co Ltd, with Tsujimoto as its president. "IPM" stood for International Playing Machine. With Breakout and its various clones dominating the video game scene, IPM started to manufacture, sell, and rent arcade hardware cabinets. In 1977, IPM partnered with Nanao Corporation of Ishikawa Prefecture to produce CRT monitors for its arcade cabinets.

Irem is probably mostly known internationally for three 1980s arcade games: Moon Patrol (1982), Kung-Fu Master (1984), and R-Type (1987). Irem has been popular in Japan with games like Photoboy for the PC Engine and In the Hunt for the arcades.

As a result of the 2011 Tōhoku earthquake and tsunami, Irem canceled the majority of its remaining video game projects, including Zettai Zetsumei Toshi 4: Summer Memories and Poncotsu Roman Daikatsugeki Bumpy Trot 2. Irem refocused to become primarily a slot-machine and pachinko developer, the industry it was in before turning to video games. Many Irem designers, including producer Kazuma Kujo, gathered to form a new company called Granzella to continue creating video games.

Jaleco

Type	*Corporation*
Founded	*October 3, 1974*
	July 3, 2006
Defunct	*May 21, 2014*
Fate	*Dissolved*
Headquarters	*Shinagawa-ku, Tokyo 141-0031*

Jaleco was founded on October 3, 1974 as the Japan Leisure Co., Ltd., a manufacturer of amusement equipment; its headquarters was in Setagaya-ku, Tokyo, Japan. In 1982, the company started developing and manufacturing arcade video games. That year, the company shortened its brand name to Jaleco and formally changed its name to Jaleco Ltd. in 1983.

Jaleco was a video game company whose focus lay in arcade titles, as well as titles for the NES and other popular computer and video game consoles of the 1980s and 1990s, most notably the Bases Loaded series and Carrier.

In 2006, it decided to become a pure holding company by renaming itself Jaleco Holding and splitting its video game operations into a newly created subsidiary that took its former name of Jaleco Ltd.

By 2000, Jaleco, still active in the development of arcade and console video games, hadn't produced any hit title in years and was in a struggling state. Its American division Jaleco USA had already left the arcade industry in 1993. In 2000, Jaleco was acquired by Hong Kong company PCCW. Jaleco, renamed PCCW Japan, gave the PCCW Group a foothold in Japan. PCCW heavily restructured the company, shutting down Jaleco's arcade division and other non-profitable departments to focus on video games for consoles of the sixth generation era. PCCW Japan itself acquired on April 2001 the VR-1 Group which included VR-1 Entertainment, a U.S. developer of massively multiplayer online role playing games, to bring a more global focus to its current and future software endeavors. In 2009, Jaleco Holding sold Jaleco Ltd to Game Yarou. On May 21, 2014, Game Yarou was declared bankrupt by the Tokyo District Court. Since then, Jaleco has disappeared and its website is no longer active.

Kaneko

Type	*Private*
Founded	*1980*
Defunct	*ca. 2007*
Fate	*Defunct*
Headquarters	*Tokyo, Japan*

Kaneko Seisakusho, also referred to as Kaneko Co. Ltd., was a Japanese video game publisher founded in Suginami, Tokyo, Japan by Hiroshi Kaneko. It published a number of games both under its brand and other companies, such as Air Buster, Nexzr, Shogun Warriors, DJ Boy, Guts'n, and the Gals Panic series. Although most of the games that Kaneko produced were standard arcade fare, they also earned a degree of notoriety for both DJ Boy (for its reputedly racist plot and negative stereotyping) and the Gals Panic series (the games often bordering on softcore pornography).

The company began business as developer, manufacturer, vendor, trader of electronic machines, and manufacturing medical equipment.

In 1982, it began its video game business as a developer of Taito Corporation's video games. In 1990, Kaneko began to make its own video game under the KANEKO brand. In Summer 1994, Kaneko closed its US branch and cancelled game projects such as Fido Dido and Socks the Cat Rocks the Hill. In April 2000, Kaneko went through financial restructuring, and exited video game business except for maintenance department. The company was moved to Shibuya, Tokyo. In July 25, 2001, Kaneko filed a lawsuit against Hitachi Software Engineering over the Super Kaneko NOVA System arcade board, and demanded 1.52 billion yen for damages. On August 12, 2004, Kaneko filed for bankruptcy. However, the company's founder, Hiroshi Kaneko, vowed to continue. In 2006, a civil lawsuit threatened to officially close the company. As of September 2007 the fate of the company is unknown, though assumed no longer existent.

The last game released by the company was Gals Panic S3 for the arcade in 2002.

Kee Games

Founded	*1974*
Founder	*Joe Keenan*
Defunct	*1978*
Fate	*Absorbed into Atari*

The arcade game market is split into manufacturers, distributors, and operators; manufacturers like Atari sell game machines to distributors—who handle several types of electronic machines—who in turn sell them to the operators of locations. In the early 1970s, distributors bought games on an exclusive basis, meaning that only one distributor in each distribution region would carry products from a given arcade game manufacturer, restricting the manufacturer to only the operators that distributor sold to. Atari, in 1973 just over a year old and largely based on their hit first game Pong, felt that as a smaller manufacturer this setup severely limited their ability to sell arcade games: they could only contract with a limited number of distributors, who would only buy a limited number of games per year.To work around this, Atari set up a secret subsidiary company in September 1973, Kee Games, which was intended to sell clones of Atari's games, in effect doubling their potential reach. The first such game by Kee, released in March 1974, was Spike, a clone of Rebound.

Kee was headed by Joe Keenan, a long-time friend of Atari co-founder Nolan Bushnell. Keenan managed to hire several defectors from Atari, and began advertising itself as a competitor.

In December 1974, the relationship to Atari was discovered by the public. However, Kee's Tank game had been so successful that the distributors wanted to buy the game even without an exclusivity agreement. At the same time, Atari was having financial and management problems, while Joe Keenan had been very successful managing Kee Games. The two companies merged, with Keenan promoted to president of Atari running the business side of things, and Bushnell focusing on engineering.

Konami

Type	*Kabushiki gaisha*
Founded	*March 21, 1969*
Founders	*Kagemasa Kōzuki*
Headquarters	*Tokyo Midtown, Minato, Tokyo, Japan*
Owner	*Kozuki family (29%)*
Employees	*5,048 (2017)*
Subsidiaries	*4K Media Inc.*

Konami Holdings Corporation, commonly referred to as Konami, is a Japanese entertainment company. It operates as a product distributor (which produces and distributes trading cards, anime, tokusatsu, slot machines and arcade cabinets), video game developer and publisher company. It also operates health and physical fitness clubs across Japan.

Konami is famous for popular video game series such as Suikoden, Castlevania, Contra, Dance Dance Revolution, Metal Gear, Pro Evolution Soccer, Silent Hill and Yu-Gi-Oh!. Konami is the twentieth-largest game company in the world by revenue.

The company's founder and current chairman, Kagemasa Kozuki, previously ran a jukebox rental and repair business in Toyonaka, Osaka before transforming the business into a manufacturer of amusement machines for video arcades. Their first coin-operated video game was released in 1978, and they began exporting products to the United States the following year. Konami began to achieve success with hit arcade games such as 1981's Frogger, Scramble, and Super Cobra, many of which were licensed to other companies for stateside release, including Stern Electronics and Gremlin Industries.

The name "Konami" (/koʊˈnɑːmi/; Japanese pronunciation: [ko͡ꜜnami]) is a conjunction of the names Kagemasa Kozuki, Yoshinobu Nakama, and Tatsuo Miyasako.

On March 3, 2015, Konami announced they would be shifting focus away from individual studios, notably Kojima Productions. Internal sources claimed the restructure was due to a clash between Hideo Kojima and Konami. Kojima left Konami several days afterwards, re-opening Kojima Productions as an independent company.

MicroProse

Founded	*1982 (as MicroProse Software Inc.)*
Founders	*Bill Stealey*
	Sid Meier
Defunct	*2003*
Fate	*Dissolved by parent company, MicroProse brand name now owned by The Cybergun Group*

MicroProse Software Inc. was an American video game publisher and developer founded by "Wild" Bill Stealey and Sid Meier in 1982. It developed and published numerous games, many of which are regarded as groundbreaking, classics and cult titles, including starting the Civilization and X-COM series. Most of their internally developed titles were vehicle simulation and strategy games.

In the early 1990s, MicroProse attempted to diversify beyond its niche roots as a sim and strategy game company. Encouraged by the success of Pirates!, MicroProse designed further action-strategy titles such as Covert Action (also designed by Sid Meier) and Hyperspeed, and experimented with the role-playing genre by developing BloodNet and Darklands (in addition to publishing The Legacy: Realm of Terror). The company invested (and subsequently effectively lost) a large sum of money to create its arcade game division as well as their own graphic adventure game engine. However, the arcade division was canceled after making only two games: F-15 Strike Eagle: The Arcade Game and Battle of the Solar System (both of which featured high-end 3D graphics but failed to become popular as they were too different from existing machines), while the adventure game engine was used for just three games: Rex Nebular and the Cosmic Gender Bender, Return of the Phantom and Dragonsphere, before it was sold off to Sanctuary Woods.

In 1993, the company lost most of their UK-based personnel and became a subsidiary of Spectrum HoloByte. The brand was revived in 2007 when Interactive Game Group acquired it from Atari Interactive, formerly Infogrames. As of 2010, the MicroProse brand is owned by Cybergun Group.

Midway Games

Founded	*1958*
	1988 (re-incorporated)
Founder	*Henry Ross*
	Marcine Wolverton
Defunct	*2010*
Fate	*Bankruptcy*
Successor	*NetherRealm Studios*

Midway Games Inc. (formerly Midway Manufacturing and Midway) was an American video game developer and publisher. Midway's franchises included Mortal Kombat, Rampage, NBA Jam and NFL Blitz. Midway also acquired the rights to video games that were originally developed by Williams Electronics and Atari Games, such as Defender, Joust, Robotron 2084, Gauntlet, and the Rush series.

The company's predecessor Midway Manufacturing was founded in 1958, as an amusement game manufacturer. In 1973 it moved into the interactive entertainment industry, developing and publishing arcade video games. The company scored its first mainstream hit with the U.S. distribution of Space Invaders in 1978. Midway was purchased and re-incorporated in 1988 by WMS Industries Inc. After years as a leader in the arcade segment, Midway moved into the growing home video game market beginning in 1996, the same year that it made its initial public offering of stock. Midway was ranked the fourth largest-selling video game publisher in 2000.

After 2000, Midway continued to develop and publish video games for home and handheld video game machines, but it experienced large annual net losses and engaged in a series of stock and debt offerings and other financings and borrowings. Sumner Redstone, the head of Viacom/CBS Corporation, increased his stake in Midway from about 15%, in 1998, to about 87% by the end of 2007. In December 2008, Redstone sold all his stock and $70 million of Midway debt to Mark Thomas, a private investor, for $100,000.

In 2009, Midway Games filed in Delaware for bankruptcy. Warner Bros. purchased most of Midway's assets, and Midway settled with Mark Thomas to relinquish his Midway stock and debt.

Mitchell Corporation

Founded	*February 1, 1960*
Defunct	*November 20, 2012*
Fate	*All research and development ceased; technically company is still active*
Headquarters	*Suginami, Tokyo, Japan*
Key people	*Roy Ozaki (CEO)* *Koichi Niida (Director)*

Mitchell Corporation was a Japanese video game developer based in the Suginami ward of Tokyo. Roy Ozaki served as president, and Koichi Niida served as vice-president. Some employees were former Capcom and TAD Corporation employees. The company was originally established on February 1, 1960, as an import/export business by the father of Roy Ozaki. Ozaki and Niida took over the company and began acting as exclusive overseas agents for such video game companies as Visco, Video System, Seta, Metro, Home Data, and other small video game manufacturers in the 1980s. Company activity was suspended on 20 November 2012.

Mitchell Corporation develops titles for home consoles, handhelds, Japanese mobile phones, the arcade and interactive kiosks located in restaurants and other places. Mitchell also distributes printed circuit boards for the arcade/coin-op market. The company also develops video games for other publishers. Since 2004 they have developed games only for Nintendo hardware.

Mitchell Corporation is best known as the game developer of Puzz Loop. Copyright and trademark registration of Puzz Loop was established in December 1999, the same year it was released to the international coin-op arcade market. Prior to this, it developed the Pang! series of games, known in America as Buster Bros. and distributed there by Capcom. Puzz Loop was first released in North America, as well as Europe, under the title Ballistic for the original PlayStation console and Game Boy Color handheld. Infogrames published the PlayStation and Game Boy Color versions in North America in late 1999, while THQ published these same versions for European territories. Tokyo Crash Mobs is the latest instalment of the Puzz Loop series.

Namco

Type	*Kabushiki gaisha*
Founded	*1955* *2006 (Bandai Namco Entertainment)*
Founder	*Masaya Nakamura*
Headquarters	*Minato, Tokyo, Japan*
Parent	*Bandai Namco Holdings*
Website	*http://www.namco.co.jp*

Namco Limited is a Japanese corporation that operates game centers and theme parks, but is best known for its previous identity as a video game developer and publisher. Namco was a front-runner during the golden age of arcade video games. Pac-Man went on to become the best-selling arcade game in history and an international popular culture icon. Namco is also known for creating successful franchises such as Galaxian, Dig Dug, Xevious, Ridge Racer, Ace Combat, Tekken, Soul and Tales.

Based in Tokyo, the company started out by running children's rides on the roof of a department store in Yokohama. The business eventually expanded throughout the Tokyo area. Nakamura Seisakusho underwent in 1959 a name change to Nakamura Manufacturing Co, Ltd. Nakamura Manufacturing Company would later be used to form the acronym "NAMCO" as a brand name in 1971 which eventually became the company's own corporate name.

Namco was the industry's first manufacturer to develop and release a multi-player, multi-cabinet competitive game, Final Lap, in 1987. This game allowed up to eight players to compete when four two-player cabinets were linked in a simple network. By 1989, games for the Nintendo Entertainment System accounted for 40% of Namco's sales.

In 2005, Namco merged with Bandai to form the holding company Namco Bandai Holdings, the third largest video game entity in Japan. In 2006, Namco's video game operations absorbed that of Bandai's, and the two companies' game production assets were spun off into Namco Bandai Games. From then on, the part of the company that was most closely associated with the Namco label would become Bandai Namco Games (now Bandai Namco Entertainment).

Nihon Bussan

Founded	*1970*
Defunct	*2014*
Fate	*Intellectual property sold to Hamster Corporation*
Headquarters	*Kita-ku, Osaka, Japan*
Employees	*30*
Website	*www.nichibutsu.co.jp*

Nihon Bussan Co., Ltd. was a Japanese video game manufacturer. The company had its headquarters in Kita-ku, Osaka. In the past they had also manufactured and sold yachts.

The company's founder Sueharu Torii established Nihon Bussan in 1970 and the company was incorporated in 1972.

1978 saw Nihon Bussan entering the arcade game market, when they debuted with a copy of the game Breakout called Table Attacker. The same year, Nihon Bussan settled with Taito by paying a license fee to launch a copy of Space Invaders titled Moon Base. Also in 1979, a business alliance was formed with Namco for a clone of Galaxian by the name of Moon Alien. However, Nihon Bussan violated the manufacturing agreement by exceeding production of Moon Alien and ended up paying Namco the excess of the license fee. Nihon Bussan continued to release successful titles such as the 1980 original works Moon Cresta and Crazy Climber. The same year, the company issued brochures that listed both Moon Base and Moon Alien as original works of Nihon Bussan.

As with the arcades, several of Nihon Bussan's titles and themes released for the household were Mahjong games. Nihon Bussan's PC Engine game Sexy Idol Mahjong incorporated undressing elements and used the first "18 years of age or older recommended" software in the home market.

In March 2014, Nihon Bussan sold the rights of all video games to Hamster Corporation. This was the result of the decision of Sueharu Torii to retire. Having declined an offer from Hamster to license Nihon Bussan's games, Torii opted instead to sell them outright and to take his retirement.

Nintendo

Type	*Public*
Founded	*23 September 1889*
Founder	*Fusajiro Yamauchi*
Headquarters	*Kyoto, Japan*
Key people	*Tatsumi Kimishima (President)*
Revenue	*¥489.095 billion (2017)*
Employees	*5,166 (2017)*

Nintendo Co., Ltd. is a Japanese multinational consumer electronics and video game company headquartered in Kyoto. Nintendo is one of the world's largest video game companies by market capitalization, creating some of the best-known and top-selling video game franchises, such as Mario, The Legend of Zelda, and Pokémon.

Nintendo was founded as a card company by Fusajiro Yamauchi on September 23, 1889. Based in Kyoto, the business produced and marketed a playing card game called "Hanafuda". The handmade cards soon became popular, and Yamauchi hired assistants to mass-produce cards to satisfy demand. In 1949, the company adopted the name Nintendo Karuta Co., Ltd., doing business as The Nintendo Playing Card Co. outside Japan. Nintendo continues to manufacture playing cards in Japan and organizes its own contract bridge tournament called the "Nintendo Cup". The word Nintendo can be translated as "leave luck to heaven", or alternatively as "the temple of free hanafuda".

By 1963, the company had tried several small niche businesses, such as cab services and love hotels. Abandoning previous ventures in favor of toys in the 1960s, Nintendo then developed into a video game company in the 1970s, ultimately becoming one of the most influential in the industry and Japan's third most-valuable company with a market value of over $85 billion. Since 1992 Nintendo has teamed with the Starlight Children's Foundation to build Starlight Fun Center mobile entertainment units and install them in hospitals. 1,000 Starlight Nintendo Fun Center units were installed by the end of 1995. From 1992 until 2016, Nintendo was also the majority shareholder of Major League Baseball's Seattle Mariners.

Nutting Associates

Founded	*1967*
Founder	*William Gilbert Nutting*
Headquarters	*Mountain View, California*

Nutting Associates was an arcade game manufacturer based in Mountain View, California, incorporated in February 1967 by William Gilbert Nutting. In 1977 the company was purchased by William "Si" Redd and eventually absorbed into the company Sircoma.

Bill Nutting became involved in the coin-operated amusement industry when he took over marketing a device called the Knowledge Computer (1964), a trivia game created by the company Edex. In 1965 the company was purchased by Raytheon and Bill Nutting took over marketing of the machine himself. In January 1966 he founded Nutting Associates to market the Knowledge Computer and a redesigned version of the device called Computer Quiz (1967) created by Richard Ball of Marketing Services. In 1968 the model was redesigned into a solid-state version.

In 1971, Nolan Bushnell sold Nutting Associates on manufacturing the game Computer Space (1971). Afterwards, Bushnell wanted a large ownership stake in the company to continue creating games for Nutting Associates, but left after not being given that opportunity to form Atari Inc. with Ted Dabney.

Nutting Associates continued manufacturing video games up until 1977 when the company was sold to "Si" Redd. A new Nutting Associates company was established in Nevada before being absorbed into the larger company Sircoma, a video poker manufacturer.

Nutting's brother, David Judd Nutting, also worked in the video game industry. He formed Dave Nutting Associates, a consulting firm that produced many of Midway's games during the 1970s and early 80s.

Ocean Software

Founded	*1983*
Founder	*David Ward*
	Jon Woods
Defunct	*1998 (Renamed)*
Fate	*Acquired by Infogrames in 1996*
Predecessor	*Spectrum Software*
Headquarters	*Manchester, England*

Ocean Software Ltd (also known in the United States as Ocean of America, Inc.), commonly referred to as Ocean, was a British software development company, that became one of the biggest European video game developers and publishers of the 1980s and 1990s.

The company started out as Spectrum Software in 1983 selling arcade clones for various home computers including the ZX81, ZX Spectrum and VIC 20. Although not named after the ZX Spectrum, the name became confusing and had to be changed so the company became Ocean Software. Some of their Spectrum Software games were re-released on Ocean with different titles so the Berzerk clone Frenzy was reissued as the Ocean game Robotics and Missile Attack became Armageddon. Their early releases (Moon Alert, Hunchback, High Noon, Gilligan's Gold, Daley Thompson's Decathlon etc.) were developed in-house, but later in 1984 Ocean Software acquired its former Liverpool rival, the defunct software developer Imagine, and focus shifted from development to publication of games. Also in 1984, Ocean struck a deal with Konami to publish their arcade games for home computers.

In 1985, Ocean Software managed to secure the first movie licences, such as Rambo, Short Circuit and Cobra, as well as the TV show Miami Vice and RoboCop which spent about a year on the top of the charts.

In 1996, Ocean Software announced to merge with french publisher Infogrames for £100 Million. After the merger Infogrames kept Ocean as a separate division publishing their own games. Ocean later acquired Digital Image Design in 1998 and in the same year, Infogrames renamed Ocean Software to Infogrames United Kingdom Limited.

Rare

Type	*Subsidiary*
Founded	*16 April 1985*
Founders	*Tim Stamper*
	Chris Stamper
Headquarters	*Twycross, England*
Parent	*Microsoft Studios*
Employees	≈200 (2008)

Rare is a British video game developer located in Twycross, Leicestershire. The company was established in 1985 by Tim and Chris Stamper, founders of Ultimate Play the Game. During its early years, Rare was backed by an unlimited budget from Nintendo, primarily concentrated on Nintendo Entertainment System games. During this time they created successful titles such as Wizards & Warriors, Battletoads, and R.C. Pro-Am. Rare became a prominent second-party developer for Nintendo, who came to own a large minority stake of the company. During this period, Rare received international recognition and critical acclaim for games such as Donkey Kong Country, GoldenEye 007, Banjo-Kazooie, Perfect Dark, and Conker's Bad Fur Day.

In 2002, Microsoft acquired Rare, who retained their original brand, logo, and most intellectual properties. It has since focused on developing games exclusively for Microsoft Studios' video game consoles. Notable releases include Kameo: Elements of Power, Perfect Dark Zero and Viva Piñata. In 2007, founders Tim and Chris Stamper left the company to pursue "other opportunities" and, in 2010, the company's focus shifted to the Xbox Live Avatar and Kinect, releasing three different Kinect Sports games. In 2015, Rare released Rare Replay, a compilation of 30 games produced by the company to celebrate their 30th anniversary. Rare is currently working on Sea of Thieves, a multiplayer adventure game.

Several key employees left Rare to form their own companies, such as Free Radical Design and Playtonic Games. Rare was widely recognised by the gaming industry and received numerous accolades from critics and journalists. The company has often been described as secretive and seclusive.

Raw Thrills

Type	*Privately held company*
Founded	*2001*
Founders	*Eugene Jarvis*
	Deepak Deo
	Andrew Eloff
Headquarters	*Skokie, Illinois, U.S.*
Employees	*25*

Raw Thrills, Inc. is an arcade game entertainment company based in Skokie, Illinois. It is best known for developing arcade games based on films.

Raw Thrills was founded in 2001 by Eugene Jarvis, Deepak Deo, and Andrew Eloff. The staff also consists of other former Midway Games employees. Currently the staff runs around 25 employees, most of whom have been with the company for the majority of its existence.

Early on, the company made games for IGT including Super Times Pay Poker, Multi-Play Blackjack, and Turbo Reelette with later games involving modifications of the Super Times Pay engine.

Raw Thrills' first independent coin-op game was Target: Terror, a light-gun shooter game which was later upgraded to Target: Terror Gold (also known as Target: Force) featuring bonus levels, end-of-round awards, and other performance enhancements.

In 2006, Raw Thrills published two titles: Big Buck Hunter PRO, developed by Play Mechanix; and The Fast and the Furious Superbikes. They also released a continuation of the successful Big Buck series, Big Buck Safari in three different configurations which included a standard 27" cabinet, a 42" LCD version and an 8'x6' projected screen Theater version.

After the success of their Fast and Furious DRIFT racing title, the company set their sights on kart-style racing with Nicktoons Nitro. The game featured licensed characters from various Nickelodeon cartoon shows.

In 2009, Raw Thrills teamed up with Konami and Activision to produce Guitar Hero Arcade. Raw Thrills engineered the game while Konami and Activision were involved to cover patenting and licensing.

Sammy Corporation

Type	*Kabushiki gaisha*
	Subsidiary
Founded	*November 1, 1975*
Founders	*Hajime Satomi*
Headquarters	*Tokyo, Japan*
Parent Sega	*Sammy Holdings*
Employees	*1,105 (2013)*

Sammy Corporation is a leading developer and retailer of pachinko and pachislot systems in Japan. It is also known for publishing a small number of video games such as the Guilty Gear, The Rumble Fish and Survival Arts series of fighting games. In 2004, it merged with Sega to form a new holding company called Sega Sammy Holdings Inc.. All the video game businesses were transferred over to Sega.

Sammy Corporation started in 1975 as Sammy Industry Co., Ltd. from the spilt of Satomi Corporation's manufacturing and marketing divisions for amusement arcade machines. In 1978, Sammy Industry built a factory in Itabashi-ku, Tokyo in order to take advantage of the growing popularity of video games, specifically Invader games. During this year, it began game machine development.

In 1982, Sammy Industry started to market and sell pachislot machines. During this time, its launched the Empire pachislot machine. In 1988, an American subsidiary of Sammy Industry was established in California, USA. In this year, Sammy Industry expanded its market by venturing into sales and marketing of video game software.

During 2003, Sammy was in talks with gaming conglomerate Sega to be part of the Sammy company. Despite Sega publicly declining the offer because the two companies lacked synergies, a takeover occurred in which Sammy purchased a 22.4 per cent stake in Sega from the company's one-time parent company, CSK. Since then, Sega and Sammy became subsidiaries of the aforementioned holding company, with both companies operating independently, while the executive departments merged. Both companies are involved in the amusement business (Sega with arcade games, Sammy with pachinko machines).

Sega

Type	*Kabushiki gaisha* *Subsidiary*
Founded	*June 3, 1960 (Nihon Goraku Bussan)*
Founders	*Martin Bromley* *Irving Bromberg* *Richard Stewart*
Parent	*Sega Holdings*

Sega Games Co., Ltd., originally short for Service Games and officially styled as SEGA, is a Japanese multinational video game developer and publisher headquartered in Tokyo, Japan, with offices around the world. Sega is known for its multi-million selling game franchises, such as Sonic the Hedgehog, Virtua Fighter, Phantasy Star, Yakuza, and Total War.

The story of Sega start in 1940, where American businessmen Martin Bromley, Irving Bromberg, and James Humpert formed a company called Standard Games in Honolulu, Hawaii, to provide coin-operated amusement machines to military bases. They saw that the onset of World War II, and the consequent increase in the number of military personnel, would mean there would be demand for something for those stationed at military bases to do in their leisure time. After the war, the founders sold that company and established a new distributor called Service Games, named for the military focus. In 1951, the government of the United States outlawed slot machines in US territories, so Bromley sent two of his employees, Richard Stewart and Ray LeMaire, to Tokyo, Japan, in 1952 to establish a new distributor. The company provided coin-operated slot machines to U.S. bases in Japan and changed its name again to Service Games of Japan by 1953.

Sega developed and manufactured numerous home video game consoles from 1983 to 2001, but after financial losses incurred from its Dreamcast console, the company restructured to focus on providing software as a third-party developer. Sega remains the world's most prolific arcade producer, with over 500 games in over 70 franchises on more than 20 different arcade system boards since 1981.

Seibu Kaihatsu

Type	*Public*
Industry	*Video game industry*
Founded	*1982*
Defunct	*1998*
Headquarters	*Tokyo, Japan*
Key people	*Hitoshi Hamada*
Website	*seibu-kaihatsu.co.jp*

Seibu Kaihatsu Inc. is a Japanese manufacturer of arcade games. The company was founded in 1982 at Chiyoda-ku, Tokyo, Japan as Seibu Denshi Inc., but changed to its current name sometime in 1984. It is currently owned by Hitoshi Hamada.

One of their earliest arcade hits was the 1989 rail shooter Dynamite Duke, one of the first to feature close combat with long-range shooting. A year later, Seibu Kaihatsu became best known for their 1990 vertical-scrolling shoot 'em up arcade game Raiden, which was successful enough to earn several sequels and spin-offs in its series of titles. In 1991, a development department known as Rise Corporation was spun from Seibu Kaihatsu. During the late '80s, Fabtek bought the rights to internationally distribute Seibu Kaihatsu's arcade titles outside Japan.

In 1999, its arcade division vanished and its official website shut down. It was also rumored that they filed for bankruptcy; in fact, Seibu Kaihatsu temporarily disbanded itself. Therefore, Fabtek's international distribution rights expired while closing its business. During the same year, they established Mahjong Cats, right before the dissolution of their relationship with adult video game developers h.m.p. and Mink to develop adult mahjong video arcade games. In 2005, the development staff left Seibu Kaihatsu to apply at MOSS, then bought the development rights to the Raiden franchise from Seibu Kaihatsu to develop Raiden III and Raiden IV in order to keep the franchise's fanbase hyped with Seibu Kaihatsu assisting them. Throughout the years MOSS have diversified their portfolio outside of vertical shooters.

SNK

Type	*Kabushiki gaisha* *Subsidiary*
Founded	*1978 (Shin Nihon Kikaku Corp.)* *(defunct on October 22, 2001)* *2001 (as Playmore Corporation)*
Headquarters	*Suita, Osaka, Japan*
Owner	*Orient Securities Co., Ltd.*

SNK Corporation is a Japanese video game hardware and software company, successor to the Shin Nihon Kikaku and current owner of the SNK video game brand and Neo Geo video game platform. The Shin Nihon Kikaku Corporation was founded in 1978 by Eikichi Kawasaki. Initially called Shin Nihon Kikaku (New Japan Project), the name was informally shortened to SNK Corporation in 1981 before becoming the company's official name in 1986.

SNK is most notable as creator of the Neo Geo family of arcade, home, and handheld game consoles, beginning in 1990. The Neo Geo line was halted in 2001, when financial troubles forced SNK Corporation to close on October 22, 2001. Anticipating the end of the company, Kawasaki founded Playmore Corporation on August 1, 2001. By October, Playmore had acquired all of the intellectual property of the former SNK Corporation. In 2003, Playmore Corporation was renamed to SNK Playmore Corporation, to more firmly establish itself as the successor to the SNK brand and legacy.

Traditionally, SNK operated primarily as a video game developer, publisher, and hardware manufacturer, focusing on arcade games but also working on console and PC games. In 2004, the company started manufacturing pachislot machines, which the company leaned heavily into before withdrawing from the market in 2015. In 2009, the company also entered an active wave of mobile game development. Classic SNK franchises like Metal Slug, Samurai Shodown and The King of Fighters feature heavily in its recent offerings.

In 2016, SNK dropped the "Playmore" name from its logo and reintroduced its original slogan, "The Future Is Now", as a means to signify "a return to SNK's rich gaming history."

Sony

Type	*Public kabushiki gaisha conglomerate*
Founded	*7 May 1946*
Founders	*Masaru Ibuka* *Akio Morita*
Headquarters	*Minato, Tokyo, Japan*
Employees	*128,400 (2017)*

Sony Corporation (often referred to simply as Sony) is a Japanese multinational conglomerate corporation. Its diversified business includes consumer and professional electronics, gaming, entertainment and financial services. The company is one of the leading manufacturers of electronic products for the consumer and professional markets. Sony was ranked 105th on the 2017 list of Fortune Global 500.

Sony Corporation is the electronics business unit and the parent company of the Sony Group, which is engaged in business through its four operating components: electronics (AV, IT & communication products, semiconductors, video games, network services and medical business), motion pictures (movies and TV shows), music (record labels and music publishing) and financial services (banking and insurance). These make Sony one of the most comprehensive entertainment companies in the world. The group consists of Sony Corporation, Sony Pictures, Sony Mobile, Sony Interactive Entertainment, Sony Music, Sony Financial Holdings and others.

Sony began in the wake of World War II. In 1946, Masaru Ibuka started an electronics shop in a department store building in Tokyo. The company started with a capital of ¥190,000 and a total of eight employees. In May 1946, Ibuka was joined by Akio Morita to found a company called Tokyo Tsushin Kogyo (Tokyo Telecommunications Engineering Corporation). The company built Japan's first tape recorder, called the Type-G. In 1958, the company changed its name to "Sony".

Sony has a weak tie to the Sumitomo Mitsui Financial Group (SMFG) keiretsu, the successor to the Mitsui keiretsu.

Square

Former type	*Public*
Founded	*September 1986*
Founder	*Masafumi Miyamoto*
Defunct	*April 1, 2003*
Fate	*Merged with Enix*
Successor	*Square Enix*
Employees	888 (2002)

Square Co., Ltd. was a Japanese video game company founded in September 1986 by Masafumi Miyamoto. It merged with Enix in 2003 and became Square Enix. The company also used SquareSoft as a brand name to refer to their games, and the term is occasionally used to refer to the company itself.

Square originated in October 1983 as a computer game software division of Den-Yu-Sha, a power line construction company owned by the father of Masafumi Miyamoto, the eventual founder of Square Co Ltd in 1986. While at the time game development was usually conducted by only one programmer, Masafumi Miyamoto believed that it would be more efficient to have graphic designers, programmers and professional story writers working together on common projects. Square's first two titles were The Death Trap and its sequel Will: The Death Trap II, both designed by part-time employee Hironobu Sakaguchi and released on the NEC PC-8801. Despite an initial reluctance to develop for video game consoles, Square entered the Nintendo Famicom market in December 1985 with the porting of Thexder.

A merger between Square and its competitor Enix was in consideration since at least 2000; however, the financial failure of their first movie, Final Fantasy: The Spirits Within made Enix hesitant to join with a company which was losing money. With the company in its second year of financial loss, Square approached Sony for a capital injection and on October, 8th 2001, Sony Corp purchased 18.6% stake in Square to bandage their loss. Following the success of both Final Fantasy X and Kingdom Hearts, the company recovered its stability. It was announced in 2002 that Square and Enix's previous plans to merge were to officially proceed.

Stern

Founded	*1977*
Headquarters	*United States*
Key people	*Gary Stern* *Sam Stern*
Owner	*Gary Stern*
Website	*sternpinball.com*

Stern is the name of two different but related arcade gaming companies. Stern Electronics, Inc. manufactured arcade video games and pinball machines from 1977-1985, and was known for 1980s Berzerk. Stern Pinball, Inc., founded in 1999, is a creator of pinball machines in North America.

Stern Electronics was formed when the Stern family bought the financially troubled Chicago Coin in 1977. Chicago Coin's assets were purchased at bankruptcy sales forming the core inventory of Stern Electronics, Inc.; however, as a separate company, they did not assume any of the debt Chicago Coin had amassed.

The first two games made by Stern were Stampede and Rawhide, both originally made by Chicago Coin, which only had changes made to their branding and logos. After a weak start, Stern Electronics' sales started picking up by the end of 1977. By 1978 they had switched over to fully solid-state electronics for their games. In 1979, Stern acquired the jukebox production assets of the bankrupt Seeburg Corporation, and the company became known as Stern/Seeburg. Coincidentally, Seeburg also owned Williams in the 1960s, when Sam Stern was its president.

When arcade video games became popular in 1980, Stern Electronics produced Berzerk. In 1983 Stern became one of many victims of the amusement industry economic shakeout that occurred. In 1985, Stern Electronics left the amusement industry. Personnel from Stern Electronics formed a short-lived venture known as Pinstar, producing conversion kits for old Bally and Stern machines. Gary Stern was the president of Stern Electronics, Inc, Pinstar Inc, and Data East pinball.

Sunsoft

Type	*Division*
Founded	*1978*
Headquarters	*Kōnan, Aichi, Japan*
Parent	*Sun Corporation*
Website	*sunsoft.jp/en*

Sunsoft, stylized as SUNSOFT, is a Japanese video game developer and publisher. Sunsoft in itself is not a company, but instead the brand name of Japanese electronic manufacturer Sun Corporation for its video games operations. Its U.S. subsidiary operated under the name Sun Corporation of America, though, as in Japan, games published there showed a logo that read only Sunsoft.

In April 1971, Sun Electronics Corporation (alternatively called Sun Denshi) was founded in Kōnan, Aichi as a manufacturer and vendor of electronics equipment.

Sun Corporation's history in video games began in October 1978 in arcades with two titles: Block Challenger and Block Perfect. Sun Corporation had several arcade hits in the early 1980s such as Arabian, Ikki and Kangaroo. At the time, its arcade video games were released under its own corporate name of Sun Electronics Corporation.

The brand Sunsoft first appeared in the latter of the 1980s when Sun Corporation began developing original games and technology for the home video game console market, with emphasis mostly on the Famicom. Sunsoft had gone international at that time, and it had the publishing might to secure major licenses of the day (such as Batman and The Addams Family). In the 1990s, Sun Corporation of America joined forces with Acclaim Entertainment to handle ad sales rights to Sunsoft's video games for game consoles.

Finally, in 1995, Sun Corporation of America heavily restructured in the face of bankruptcy, and all the company's pending projects were either sold to other companies or cancelled. On September 14, 2006, Nintendo announced that Sunsoft was a partner on the Wii's Virtual Console.

Taito

Type	*Kabushiki gaisha* *Subsidiary*
Founded	*August 24, 1953*
Founder	*Michael Kogan*
Headquarters	*Shinjuku, Tokyo, Japan*
Employees	*609 (2017)*
Parent	*Square Enix Holdings*

Taito Corporation is a Japanese video game developer and publisher of arcade hardware and mobile phones, and an operator of video arcades. It is also a former publisher of home video games. Taito is known for producing hit arcade games, such as Space Invaders, Bubble Bobble, and Arkanoid. It has produced arcade games all around the world, while also importing and distributing American coin-op video games in Japan. Taito owns several arcades in Japan known as Taito Stations or Game Taito Stations.

The company was founded in 1953 by a Russian Jewish businessman named Michael Kogan as Taito Trading Company. Taito started out importing and distributing vending machines. It was also the first company to distill and sell vodka in Japan. Later, it began leasing jukeboxes and eventually started to manufacture its own. Taito began producing electro-mechanical arcade games in the 1960s.

On August 22, 2005, it was announced that the gaming conglomerate Square Enix would purchase 247,900 Taito shares worth ¥45.16 billion ($409.1 million), to make Taito Corporation a subsidiary of Square Enix. The purpose of the takeover by Square Enix was to both increase Taito's profit margin exponentially as well as begin its company's expansion into new forms of gaming (most notably, the arcade scene), and various other entertainment venues. The takeover bid from Square Enix was accepted by previous stockholder Kyocera, making Taito an official Square Enix subsidiary. By March, 2006 Taito became a subsidiary wholly owned by Square Enix and was delisted from the First Section of the Tokyo Stock Exchange. Despite being a subsidiary to Square Enix Holdings, the parent company has kept the branding of Taito distinct from Square Enix.

Treasure

ype	*Kabushiki gaisha*
Founded	*June 19, 1992*
Headquarters	*Tokyo, Japan*
Key people	*Masato Maegawa (CEO)*
Employees	*20-30*
Website	*http://www.treasure-inc.co.jp/*

Treasure Co., Ltd. is a Japanese video game developer, founded by former employees of Konami on June 19, 1992. Treasure is best known for classic-style action games that employ innovative gameplay systems. Their greatest commercial successes have been games like Wario World and Mischief Makers, but they are better known for their critical successes, such as Sin and Punishment, Gunstar Heroes, Bangai-O, and Ikaruga. Their first released game was Gunstar Heroes, although McDonald's Treasure Land Adventure was developed first.

Treasure is a small, privately held company, consisting of around 30-40 members, though this number is somewhat misleading as they also employ independent contractors to assist development and sometimes partner with other companies like Sega, G.rev and Nintendo to increase the size of their teams. They have worked on many titles based on licenses, including Astro Boy, McDonald's, Bleach and Tiny Toon Adventures, as well as partnering with companies like Sega, Enix and Nintendo to produce original properties.

Treasure does not have a rigid hierarchy. There are not designated "directors" from project to project; all directors also work as programmers, artists, or composers, and may work on other projects that they are not directing.

For the first five years of Treasure, the company produced games exclusively for Sega consoles. According to a Treasure representative, their first game (Gunstar Heroes) was developed on the Sega Genesis for hardware performance reasons, and after that they continued developing for Sega consoles since their fan base consisted of owners of those consoles.

Tecmo

Type	*Kabushiki gaisha*
Founded	*July 31, 1967*
Defunct	*April 1, 2010*
Fate	*Merged with Koei*
Headquarters	*Tokyo, Japan*
Key people	*Tomonobu Itagaki*
Parent	*Koei Tecmo*

Tecmo Co., Ltd. , was a Japanese video game corporation founded in 1967. Tecmo is known for the Star Force, Dead or Alive, Ninja Gaiden, Deception, Monster Rancher, Rygar, Tecmo Bowl, Fatal Frame and Gallop Racer video game series. When it was still called Tehkan, the company released arcade games such as Bomb Jack and Tehkan World Cup. The company was founded on July 31, 1967 as a supplier of cleaning equipment. By 1969, it started to sell amusement equipment.

The origins of Tecmo dates as a company specialized in the management of building maintenance including the supplying of cleaning equipment. It was founded on July 31, 1967 as Tehkan Ltd. with roots dating three years earlier as the Empire Administration Co., Ltd founded in September 1964. The company was renamed Tecmo in 1986. Tecmo's first internally developed home video game Mighty Bomb Jack was released for the Family Computer in April 1986.

By the turn of the decade, Tecmo was firmly in the camp of video game consoles. Though still involved in the arcade industry, much of the success was achieved on the Nintendo Entertainment System with titles such as Ninja Gaiden, Tecmo Bowl and the Japan-only Tsuppari Ōzumō. When Sony released its PlayStation in the 1990s, Tecmo joined the endeavor which set the tone for series such as Dead or Alive, Monster Rancher, Deception and Gallop Racer.

In 2009, Tecmo merged with Koei to form the holding company Tecmo Koei Holdings and was operated as a subsidiary until its disbandment in early 2010. In April 2010, Tecmo was dissolved and its video game franchises are now published by Koei Tecmo Games.

Universal Entertainment Corporation

Type	*Public (K.K.)*
Founded	*December, 1969*
Formerly	*Aruze Corporation*
Headquarters	*Tokyo*
Website	*www.universal-777.com/en/*

Universal Entertainment Corporation, formerly known as Aruze Corporation, is a Japanese manufacturer of pachinko, slot machines, arcade games and other gaming products, and a publisher of video games. Aruze possesses licenses to both manufacture and distribute casino machines in the American states of Nevada, Mississippi and New Jersey. The company's corporate headquarters are in Tokyo. Aruze is also the licence holder of the video game franchise Shadow Hearts. The company owns 21% of Wynn Resorts. On November 1, 2009 Aruze Corporation changed its name to Universal Entertainment Corporation.

Universal Lease Co., Ltd was established in December 1969. It later changed its name to Universal Ltd in Japan and Universal USA in America. Universal Distributing Company opened as a U.S. subsidiary to sell video games direct to operators. Universal's greatest hit game was "Mr. Do!" in 1982. Other games include the hugely influential platform game Space Panic (1980) and the maze game Lady Bug (1981). Cashing-in on the success of laserdisc video games, Universal released Super Don Quix-ote in 1984, on a new standardized laserdisc video game system they called the Universal System 1. A new game was planned every six months for the Universal System 1, including an unreleased laserdisc adventure game based on Mr. Do!, but the company stopped producing arcade games in 1985, and Super Don Quix-ote ended up being the only game released for the system. Universal Distributing of Nevada (UDN) was established to begin selling Universal's first slot machines direct to the gaming industry. In January 2005, the company became a wholly owned subsidiary of Aruze.

Williams

Type	*Division*
Predecessor	*Williams Manufacturing Company*
Founded	*1974*
Headquarters	*Enterprise, Nevada, United States*
Parent	*Scientific Games Corporation*
Website	*www.wms.com*

WMS Industries, Inc. is an American electronic gaming and amusement manufacturer in Enterprise, Nevada. WMS traces its roots to 1943, to the Williams Manufacturing Company, founded by Harry E. Williams. However, the company that became WMS Industries was formally founded in 1974 as Williams Electronics, Inc.

Williams initially was a manufacturer of pinball machines. In 1964, Williams was acquired by jukebox manufacturer Seeburg Corp. and reorganized as Williams Electronics Manufacturing Division. In 1973, the company branched out into the coin-operated arcade video game market with its Pong clone Paddle Ball, eventually creating a number of video game classics, including Defender and Robotron: 2084. In 1974, Williams Electronics, Inc. was incorporated as a wholly owned subsidiary of Seeburg. Williams Electronics was sold as an independent company during the bankruptcy of Seeburg in 1980.

In 1987, Williams changed its parent name to WMS Industries, Inc. when it made its public offering. WMS is a shortening of Williams, which it also selected for its NYSE ticker symbol. In 1988, it acquired competitor Bally/Midway, which it spun off in 1998, together with its video game business. WMS entered the reel-spinning slot machine market in 1994. It closed its pinball division in 1999.

WMS merged with Scientific Games in October 2013, becoming a wholly owned subsidiary of Scientific Games. Scientific Games paid $1.5 billion for WMS, and WMS shareholders received $26.00 per share. At the time of the merger, the company's stock ceased trading on the New York Stock Exchange.

Arcade system board

An arcade system board is a dedicated computer system created for the purpose of running video arcade games. Arcade system boards typically consist of a main system board with any number of supporting boards.

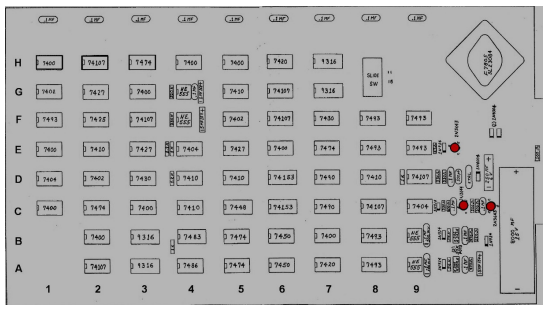
The earliest non-microprocessor based arcade system boards were designed around codeless state machine computers with the main board and any support boards consisting of discrete logic circuits comprising each element of the game itself. The next generation of arcade system boards, with the inclusion of microprocessor based technology, incorporated the game program code directly on the main system board via game code stored in ROM chips mounted on the main board.

Later arcade system boards, including the DECO Cassette System, SNK's Neo-Geo, Capcom's CPS-2, and Sega's NAOMI, separated the system board from the game program itself, akin to a home video game console and cartridge/CD/DVD/Hard Disk. This method benefitted both manufacturers and arcade game owners. Once the system board was purchased, the owner could switch out the games at a fraction of the price and with less effort, and the manufacturers could produce fewer of the costly system boards and more of the less-costly games.

Currently, the company with the record of the highest number of original arcade system boards is Sega.

Atari

PONG (1972-1976)
Unlike modern video games, PONG did not use a CPU, nor did it produce graphics with pixels. Every object put on the screen was generated by timing circuits used to encode the video signal and turn it on or off depending on its location. The global schematic of PONG can seem complicated, but in fact every section is not very hard to understand once the main operation is understood. Moreover, PONG happens to have one ghost hole on the upper left corner of the screen where the ball can only pass, and it even has a bug in the bounce circuitry (the schematic is correct, but the pcb has a mistake).

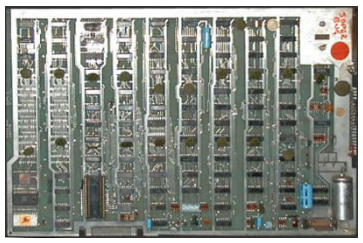


Top view of the PCB diagram. shows the top view of the PCB. The three transistors are shown in red.

Atari did a big mistake at the begining. As a matter of fact, a game without patent has no protection against bootlegers, even if it uses an analog or a digital system without software. Atari did not patent PONG until 1973 and many competitors started making their own version of PONG just a few weeks after the release of Atari's game. Some copies are nearly same, even so similar that the printed circuit board looks identical. However, some other versions were designed from scratch, or at least from basic elements of Atari PONG such as sync, paddle and ball generators.

"pong-story.com"

Atari 6800 Based (1976-1979)
The 6800 is an 8-bit microprocessor designed and first manufactured by Motorola in 1974. The MC6800 microprocessor was part of the M6800 Microcomputer System that also included serial and parallel interface ICs, RAM, ROM and other support chips. A significant design feature was that the M6800 family of ICs required only a single five-volt power supply at a time when most other microprocessors required three voltages. The M6800 Microcomputer System was announced in March 1974 and was in full production by the end of that year.



The 6800 architecture and instruction set were influenced by the then popular Digital Equipment Corporation PDP-11 mini computer. The 6800 has a 16-bit address bus that could directly access 64 kB of memory and an 8-bit bi-directional data bus. It has 72 instructions with seven addressing modes for a total of 197 opcodes. The original MC6800 could have a clock frequency of up to 1 MHz. Later versions had a maximum clock frequency of 2 MHz.

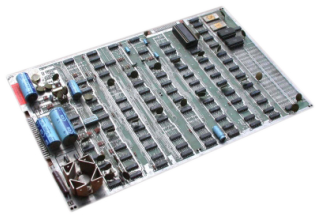
In addition to the ICs, Motorola also provided a complete assembly language development system. The customer could use the software on a remote timeshare computer or on an in-house minicomputer system. The Motorola EXORciser was a desktop computer built with the M6800 ICs that could be used for prototyping and debugging new designs. The 6800 was popular in computer peripherals, test equipment applications and point-of-sale terminals.

"revolvy.com"

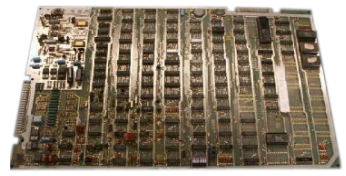
Atari 6502 Black & White Raster (1976-1980)

Atari 6502 Color Raster (1977-1989)

Atari 6502 Vector (1979-1980)



ATARI 6502 B&W RASTER



ATARI 6502 VECTOR

Atari Centipede Hardware (1980-1983)

Atari Cyberball Hardware (1989)
The Atari Cyberball Hardware is an arcade system board used for the games Cyberball and Cyberball 2072.

Atari Gauntlet Hardware (1985-1988)
Based upon some of the most elaborate hardware design in Atari's history to date, it is the company's first coin-operated game that features a voice synthesizer chip.

Atari Hard Drivin' Hardware (1988-1993)

Atari Missile Command Hardware (1980-1983)

Atari Kangaroo (1982-1983)

Atari Star Wars Vector (1983-1985)
CPU: 2 x 6809 @ 1.5 MHz
Sound: 4 x Pokey @ 1.5 MHz, TMS5220 @ 640 kHz
The game features several digitized samples of voices from the movie. The Star Wars Vector board was used for the games Star Wars and The Empire Strikes Back.

Atari System 1 (1984-1987)
Main PCB: A043096 SYS I LSI MAIN
Main CPU: Motorola MC68010L8 [DIP] @ 7.159090 MHz
Sound CPU: MOS Technology M6502 @ 1.789772 MHz
Sound Chips: Yamaha YM2151 @ 3.579545 MHz, 2 x Pokey @ 1.789772 MHz, TMS5220 @ 625 KHz
Main Rom: 136032
*Protection Chip: Slapstic 137412-1** - Slapstic F.A.Q.*
Video Resolution: 336 x 240
Colours: 256 colours from a palette of 1024
Pinouts : Atari System 1 Pinouts
PCB : Original TTL PCB Version
The Atari System 1 was Atari Games' first upgradeable arcade game hardware platform. Introduced in 1984, the System 1 platform was used for the games: Marble Madness, RoadBlasters Peter Pack Rat, Road Runner, Indiana Jones and the Temple of Doom and

Relief Pitcher.

The hardware used a large circuit board with a Motorola 68010 main CPU running at 7.159 MHz, a MOS Technology 6502 sound CPU running at 1.789 MHz, a system ROM, text and graphics display hardware, and control interfaces. Two large edge-card connectors allowed a "cartridge board" to be plugged in; the cartridge board supplied the main program ROMs, sound program ROMs, graphics ROMs, graphics shift registers, a "SLAPSTIC" copy protection chip, a Yamaha YM2151 FM sound generator, a POKEY and (for some games) TI TMS5220 LPC speech synthesis chip. System 1 was capable of LPC speech synthesis chip. System 1 was capable of generating a max resolution of 336 x 240 with 256 colors from a palette of 1024 colors.

Converting one System 1 game into another generally required replacing the cartridge board, attraction marquee, control panel, and in some cases installing additional controls (e.g., foot pedal for Road Blasters).

Early System 1 boards and cartridge boards used large numbers of 7400 series TTL chips. These boards were later replaced by the functionally identical "System 1 LSI Main" and "LSI Cartridge" boards, which used ASICs for reduced manufacturing costs.

Modular or upgradeable video games were not commonly offered by the major video game companies in the 1970s and 1980s, because it was more profitable to sell an entirely new machine. System 1 and the Japanese JAMMA wiring standard were attempts to move to a modular solution, though there were many smaller companies that sold conversion kits for competitors' hardware.

The System 1 and its games are noted for the use of "raw" sounding FM Synthesizers for sound effects and music: that is, the music many times used instruments that had the modulation settings turned too high or too low to emulate realistic sounding instruments, instead creating a warbly or noisy sound.

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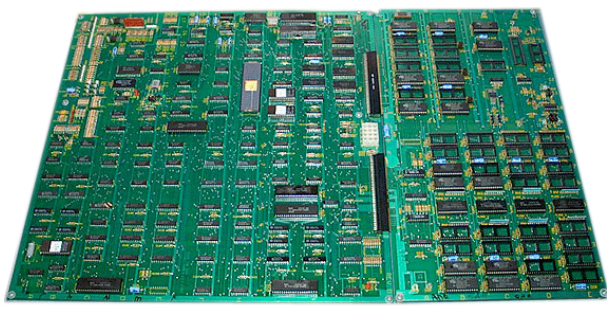
ATARI SYSTEM 1



Motherboard

Marble Madness cartridge

Atari System 1 (1984-1987)
Main PCB: A042571 ATARI SYSTEM II CPU
Main CPU: DEC T11 @ 10 MHz (DEC 21-17311-02)
Sound CPU: MOS Technology M6502 2.2 MHz
Sound Chips: Yamaha YM2151 @ 3.579545 MHz, 2 x Atari Pokey @ 1.789772 MHz, Texas Instruments TMS5220 @ 625 KHz
Oscillators: 14.31818 & 20.000
VLSI: 645 V D727B, VGC7205-0672, 137304-2002 [40pin DIP, row 7]
Other Chips: 8645 137430-001 [40pin DIP, row 6/row 7]
*Protection Chip: Slapstic 137412-1** - Slapstic F.A.Q.*
Video Resolution: 512 x 384
Board composition: A main board and a video board, with eeproms in both.
Very soon after the introduction of the Atari System 1, the Atari System 2 was introduced. The System 2 platform was used for the games: 720°, Paperboy, Championship Sprint, Super Sprint, APB : All Points Bulletin, Accelerator (unreleased prototype) and Gremlins (unreleased prototype).

Probably the most noticeable difference between the System 2 and System 1 games was the fact that the System 2 used higher resolution graphics ics. The video resolution was 512x384 and as such a medium-resolution monitor was used (System 1 used low resolution).

Atari 68000 Based (1982-1992)
The Motorola 68000 series (also termed 680x0, m68000, m68k, or 68k) is a family of 32-bit CISC microprocessors. During the 1980s and early 1990s, they were popular in personal computers and workstations and were the primary competitors of Intel's x86 microprocessors. They were most well known as the processors powering the early Apple Macintosh, the Commodore Amiga, the Sinclair QL, the Atari ST, the Sega Genesis/Mega Drive, and several others. Although no modern desktop computers are based on processors in the 68000 series, derivative processors are still widely used in embedded systems.

"revolvy.com"

Atari DUAL 68000 Based (1989-1990)
Main CPU: 2 x MC68000P8 @ 7.159090MHz
Sound CPU: 6502 @ 1.7895MHz
Sound Chips: YM2151 @ 3.579MHz, TMS5220 @ 650.727 KHz

Atari G1 (1990)
PCB: A047896-01 G1
Main CPU: 68000 (MC68HC000P12F @ 16MHz [DIP])
ROM: 136079
Sound: Stand-Alone Audio II (6502 @ 1.790 MHz, driving YM-2151 + OKI 6295 ADPCM)
Oscillators: 14.31818
*Protection Chip: Slapstic 137412-1** F.A.Q.*
Custom Chip: 8932 137419-104 [40pin DIP, 60H]
Motorola: SOS, ZKZKAE8949, 137550-001 [40pin DIP, 110J/120J]
Video resoution: 336 x 240
Hardware Features: Run-length encoded, hardware zoom, 256 priority levels
The Atari G1 is a 16-bit arcade system board manufactured by Atari Games. Games using this system board is Hydra and Pit Fighter.

Atari G42 (1991-1992)
PCB: A049757 FSG42-B
Main CPU: MC68HC000P12
Oscillators: 14.31818 & 20.000
Sound: Stand-Alone Audio III (6502 @ 1.790 MHz, driving YM-2151 + OKI 6295 ADPCM)
Motorola: SOS, 137550-001 [40pin DIP, 12F/18D]
Other Chips: 9151, 137419-104 [40pin DIP, 18J]
Other Chips: LC9208, 137665-1020 [44pin PLCC, 3E]
Video resoution: 336 x 240
Other Features: Run-length encoded, hardware zoom, 256 priority levels
The Atari G42 is a 16-bit arcade system board manufactured by Atari Games. Games using this system board is Road Riot 4WD and Guardians of the 'Hood.

Atari Arcade Classics Hardware (1992)

Atari GX2 (1992)
PCB: A049810 GX2
Main CPU: MC68EC020FG16
Oscillators: 14.31818MHz
Sound: Stand-Alone Audio II (6502 @ 1.790 MHz, driving YM-2151 + OKI 6295 ADPCM)
Motorola: SOS, 137550-001 [40pin DIP, 3L]
Other Chips: 9220, 137419-104 [40pin DIP, 5L]
The Atari GX2 is a 32-bit arcade system board manufactured by Atari Games. Games using this system board is Moto Frenzy, Space Lords and Road Riot's Revenge.

Atari GT (1994)
Main CPU: 68020
Sound CPU & Chip: CAGE Audio System
Video resoution: 336 x 240
The Atari G42 is a 16-bit arcade system board. Games using this system board is Road Riot 4WD and Guardians of the 'Hood.

Atari Cojag (1994-1996)
Main CPU: R3000 @ 33 Mhz (68EC020 @ 25Mhz for Area 51 only)
Graphics Chip: "Tom" @ 26MHz
Sound - I/O Chip: "Jerry" @ 26 MHz

The main CPU of the Cojag board is a R3000 @ 33 Mhz (68EC020 @ 25Mhz for Area 51 only). It has a video controller to generate all the video signals needed. It has an object processor which can render sprites or bitmaps, scaled or straight, in a number of different formats. It also has a blitter which can do complex object manipulations like rotation, scaling,
Z buffering and Gouraud shading. Finally, there is a RISC DSP built into the graphic chip, Tom, which runs a custom instruction set designed by Atari. The DSP is designed to run in parallel with the main CPU to handle fancy graphics. The sound - I/O Chip is a "Jerry" @ 26 MHz.

It has several timers and is connected to a pair of 16-bit DACs. These are controlled by another RISC DSP, related to the one in Tom, that is generally used to play sounds. It is also responsible for all the I/O with controllers and other parts of the system.

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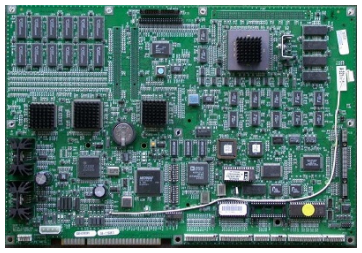
Atari Playstation (1996)

Atari Phoenix (1996)
Main CPU: MIPS R4700 @ 100MHz (50MHz system clock)
System Memory : 4MB, 512KB Boot ROM.
Graphics: 3DFX FBI with 2MB frame buffer, 3DFX TMU with 4MB texture memory.
Sound CPU: DCS Sound System (ADSP 2115 @ 16MHz)
Sound Memory: 4MB DRAM, 32KB Boot ROM.
Other Chips: Galileo GT64010 system controller, National Semiconductor PC87415 IDE controller, Midway I/O ASIC.
Board composition: Main PCB and Hard Drive.
Hardware Features: Textured 3D, all normal 3DFX features.
The game using this board is Wayne Gretzky's 3D Hockey.

Atari Flagstaff (1996-1997)
Main CPU: MIPS R5000 @ 200MHz (system clock 50MHz)
System Memory: 8MB, 512KB Boot ROM.
Graphics: 3DFX FBI with 2MB frame buffer, 2 x 3DFX TMU with 4MB texture memory.
Sound CPU: CAGE Sound System (33MHz TMS32C031 @ 33MHz)
Sound Memory: 8MB ROM, 512KB Boot ROM.
Other Chips: Galileo GT64010 system controller, National Semiconductor PC87415 IDE controller, Midway I/O ASIC, SMC91C94 ethernet controller, ADC0848 8 x A-to-D converters,
Board composition: Main PCB and Hard Drive.
Hardware Features: Textured 3D, all normal 3DFX features.
The Flagstaff arcade board are made for the two San Francisco Rush games.

Atari Seattle (1997-1998)
Main CPU: MIPS R5000 @ Either 144MHz/150MHz/192MHz/200MHz (system clock 48MHz/50MHz)
System Memory: 8MB, 512KB Boot ROM.
Graphics: 3DFX FBI with 2MB frame buffer, 3DFX TMU with 4MB texture memory.
Sound CPU: DCS Sound System (ADSP 2115 @ 16MHz)
Sound Memory: 4MB DRAM, 32KB Boot ROM.
Other Chips: Galileo GT64010 system controller, National Semiconductor PC87415 IDE controller, Midway I/O ASIC.
Board composition: Main PCB and Hard Drive.
Hardware Features: Textured 3D, all normal 3DFX features.



There are actually 4 types of Seattle board systems, with varying speeds. They will interchange but if a 200Mhz game is on a 150 Mhz board, it will run slow during high processing moments. This system was also used by Midway.

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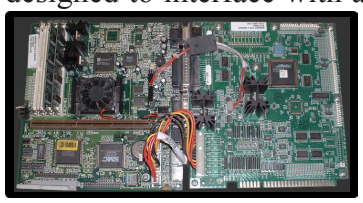
Atari Media GX (1998)
Hardware : Cyrix Media GX PC with Daughter Board.
The MediaGX CPU is an x86 compatible processor that was manufactured and designed by Cyrix and later after merger manufactured by National Semiconductor, and was introduced in 1997. The core is based on the integration of the Cyrix Cx5x86 CPU core with hardware to process video and audio output (XpressRAM, XpressGRAPHICS, XpressAUDIO).

Whether this processor belongs in the fourth or fifth generation of x86 processors can be considered a matter of debate as the processor was based on the 5x86 (a scaled down version of the Cyrix 6x86). While the 5x86 was intended to compete with the Intel Pentium line, the 5th generation x86, it was designed to interface with a 4th generation (80486) motherboard and had only the 486's instruction set, lacking the ability to run software requiring Pentium's new instructions.



The MediaGX CPU was mostly used for subcompact laptops. It was also used in the CTX EzBook V92C266, Compaq Presario 1220 and 1230 laptops, Compaq Presario 2100 and 2200 desktops, Casio Cassiopeia Fiva tablet PC, and many others, as well as in high-performance embedded applications such as the Pinball 2000 arcade pinball system and Atari Games arcade platforms. Sun Microsystems used MediaGXm in the Dover JavaStation.

Atari Vegas (1998-1999)
Main CPU: MIPS RM7000
Graphics: 3DFX Voodoo Banshee Chipset
Sound: DCS Sound System
Board composition: CPU board, IO board, 3Dfx Banshee video card and Hard Drive.
Hardware Features: Textured 3D, all normal 3DFX Banshee features.

Atari Denver (1999-2003)
Main CPU: MIPS RM5000
Graphics: 3DFX Voodoo 3 Chipset
Sound: DCS Sound System
Board composition: CPU board, IO board and Hard Drive.
Games that use the board include the two San Francisco Rush 2049 games.

Bally

Bally Sente Sac 1 (1984-1987)
Main CPU: M6809 @ 1.25 MHz
Sound CPU: Z80 @ 4 MHz
Sound chip: 6 x CEM3394

Bally Sente Sac 2 (1987)
Main CPU: 68000 @ 8MHz, M6809 @ 1.25 MHz
Sound CPU: Z80 @ 4 MHz
Sound chip: 6 x CEM3394
Sentec Sac 2 are used for the game Shrike Avenger.

BrezzaSoft

Crystal System (2001–2003)
CPU: ADC SE3208 32bit RISC CPU @ 43 MHz
Video and Sound: Magic Eyes VRender0 Chip
Memory: Main - 8MByte, Texture - 8Mbyte, Frame - 8Mbyte, Data - Programmable
Interface: JAMMA
VRender0 Notes: The Magic Eyes VRender0 chip contains:
- CPU Core ADC SE3208
- 32 channels wavetable synth (8bit linear, 16bit linear and 8bit ulaw sample format)
- Custom 2D video rendering device (Zoom in/out, Rotation, Shading, Texture Mapping, Alpha-Blending - all MS

Direct X compatible)
- All associated I/O

of the processing work is done by the "Magic Eyes VRender0", a large IC in the middle of the PCB.
Brezzasoft Crystal System is an arcade system released by Brezzasoft in 2001, shortly after the SNK went bankrupt. It was coined the "Ultimate 2D Rendering Game Machine", poised to replace the SNK Neo Geo MVS. The main PCB is small (approx 6" square) and contains only a few components. All of the processing work is done by the "Magic Eyes VRender0", a large IC in the middle of the PCB.

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Capcom

Capcom Commando Hardware (1985-1988)
CPU: Z80 (Different speed per game)
Sound CPU: Z80 (Different speed per game)
Sound Chip: 2 x YM2203 (Different speed per game)

Capcom Section Z Hardware (1985-1987)
CPU: Z80 @ 6 MHz
Sound CPU: 2 x Z80 @ 4 MHz
Sound Chip: 2 x YM2203 @ 1.5 MHz (+ MSM5205 @ 384 kHz on some games)

CP System (1988–1995)
The CP System or CPS is an arcade system board developed by Capcom that ran game software stored on removable ROM cartridges. More than two dozen arcade titles were released for CPS-1, before Capcom shifted game development over to its successor, the CP System II.

After a number of arcade game boards designed to run only one game, Capcom embarked upon a project to produce a system board that could be used to run multiple games, in order to reduce hardware costs and make the system more appealing to arcade operators.

The system was plagued by many bootleg versions of its games. In particular, there were so many bootleg versions of Street Fighter II, that they were more common in some countries than the official version. The CP System hardware was also utilized in Capcom's unsuccessful attempt at home console market penetration, the CPS Changer, a domestic version of the CP System similar to the Neo-Geo AES.

CP System II (1993–2003)
Main CPU: 68000 @ 16 MHz
Sound CPU: Z80 @ 8 MHz
Sound Chips: Q Sound @ 4 MHz
Color Palette: 32 bit
Total On Screen Colors: 4096
Colors per tile: 16 (4 bits per pixel)
Object Number: 900 (16 x 16 pixels)
Scroll Faces: 3
Resolution: 384 x 224
Maximum Rom Capacity: 322 Megabits
The CP System II or CPS-2 is an arcade system board that Capcom first used in 1993 for Super Street Fighter II. It was the successor to their previous CP System and Capcom Power System Changer arcade hardware and was succeeded by the CP System III hardware in 1996.

The earlier Capcom system board, the original CP System, while successful, was very vulnerable to bootleggers making unauthorized copies of the games. In order to rectify the situation, Capcom took the CP System hardware (with QSound) with minimal changes and employed encryption on the program ROMs to prevent software piracy. Due to the encryption, the system was never bootlegged until unencrypted program data became available.

The CP System II consists of two separate parts; the A board, which connects to the JAMMA harness and contains components common between all CP System II games, and the B board, which contains the game itself. The relationship between the A and B board is basically the same as that between a home video game console and cartridge.

CPS2 was colour coded, these were to define the regions they were intended for, they were as follows;

Green: Japan
Blue: U.S.A. and Europe
Orange: South America
Grey: Asia
Yellow: All (Rent version)
Black: All in one unit
Grey and Orange game boards require the main 'A' board of matching color to work. Green and Blue boards are totally interchangeable meaning Green game boards will work on a Blue 'A' board and visa versa. A Yellow case shows a game is the rent version and these were made to fit 'A' boards as required.

The B boards hold battery-backed memory containing decryption keys needed for the games to run. As time passes, these batteries lose their charge and the games stop functioning, because the CPU cannot execute any code without the decryption keys. This is known to hobbyists as the "suicide battery". It is possible to bypass the original battery and swap it out with a new one in-circuit, but this must be done before the original falls below 2V or the keys will be lost.

Consequently, the board would just die anyway, meaning even if used legally it would not play after a finite amount of time (Unless a fee was paid to Capcom to replace it).

Due to the heavy encryption, it was believed for a long time that CP System II emulation was next to impossible. However, in January 2001, the CPS-2 Shock group was able to obtain unencrypted data from the original ROM images, making emulation possible, as well as restoring cartridges that had been erased because of the suicide system.

In January 2007, the encryption method was fully reverse-engineered by Andreas Naive and Nicola Salmoria. It has been determined that the encryption employs two four-round Feistel ciphers with a 64-bit key. The algorithm was thereafter implemented in this state for all known CPS-2 games in MAME.

In April 2016, Eduardo Cruz, Artemio Urbina and Ian Court announced the successful reverse engineering of Capcom's CP System 2 security programming, enabling the clean "de-suicide" and restoration of any dead games without hardware modifications.

CP System III (1996–1999)
Main CPU: Hitachi SH2 @ 25 MHz
Storage: SCSI CD Rom, RAM and Flash ROM.
RAM: SIMMs on the left will physically hold 16M of data each (each has 8x 16M Flash ROMs, there's 4 SIMMs plugged in on this board). The SIMMs on the right will physically hold 8M each (there's 4 Flash ROMs on each board and there are 2 SIMMs plugged in)
OSC: 60MHz. 42.9545MHz, XTAL 3.6864MHz
The CP System III was first used by Capcom in 1996 with the arcade game Red Earth. It was the second successor to the CP System arcade hardware, following the CP System II. It would be the last proprietary system board Capcom would produce before moving on to the Dreamcast-based Naomi platform.

The CP System III features a security mechanism; games are supplied on a CD, which contains the encrypted game contents, and a security cartridge containing the game BIOS and the SH-2 CPU with integrated decryption logic, with the per-game key stored in battery-backed SRAM. When the CP System III board is first powered on, the contents of the CD are loaded into a bank of SIMMs on the

motherboard, where it is executed. The program code is then decrypted at run time via the security cartridge. The security cartridge is sensitive to any sort of tampering, which will result in the decryption key being erased and the cartridge being rendered useless. Games become unplayable when the battery inside the security cartridge dies. The lone exception is Street Fighter III: 2nd Impact, which uses a default set of decryption keys that are written to dead cartridges on boot.

In June 2007, the encryption method was reverse-engineered by Andreas Naive, making emulation possible.

Cave

Cave 1st Generation (1994–2001)
CPU: MC68000
Sound CPU: Z80 [Optional]
Sound Chips : YMZ280B or 1 or 2 OKIM6295 + YM2203 / YM2151 [Optional]
CAVE 1st Generation Hardware, also known as CAVE 68000 Hardware, is the first arcade hardware used by Cave.

The CAVE 68000 was a popular hardware board used by many companies besides Cave. Other companies that used the hardware include Atlus and Namco.

Most Cave-developed games on this hardware feature the bizarre legal warning

Cave Variant PolyGame Master (2002-2003)
The PolyGame Master (PGM) is an arcade system board released in 1997 by the Taiwanese company IGS. The PGM was developed in order to compete with the likes of SNK's Neo Geo MVS system in Taiwan. It was succeeded by PGM2 in 2007, and PGM3 in 2012.

Certain later games, released by CAVE, came on a single dedicated board and utilizes a customized BIOS programmed by CAVE.

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Cave CV1000B (2004–2007)
CPU: Hitachi SH-3 CPU, 133 Mhz Clock
Sound Chip: Yamaha YMZ770C-F
Other Chips (Based on Ibara): Altera Cyclone EP1C12F324C8 FPGA (i think used as Video-DSP and SD-RAM Controller), K9F1G08U0A 128M x 8 Bit NAND Flash Memory, 1x MX29LV160BBTC-90 Flash Memory and, 2x MX29LV320ABTC-90 Flash ICs (space for up to 2 more Flash ICs is not used), 1xMT48LC2M32B2-6 SDRAM, and 2x MT46V16M16. LA4708 Audio amplifier.

The CAVE CV1000 is the third generation arcade hardware from Cave. The CAVE CV1000 hardware was used in all arcade games released by Cave from Mushihimesama in 2004 through DoDonPachi SaiDaiOuJou in 2012, with the exception of Deathsmiles II. The CAVE CV1000 is also known as Cave SH-3 hardware, due to the arcade system being powered by a Hitachi SH-3 CPU. There were two versions of the CAVE CV1000: the CV1000-B, which is the original PCB first released with Mushihimesama, and the CV1000-D with more RAM, first released with DoDonPachi DaiFukkatsu.

After the release of DoDonPachi SaiDaiOuJou, Cave would no longer produce games for the CAVE CV1000. Future releases would be be for the NESiCA x Live system, which requires a Taito Type X² or Taito Type X³.

CAVE CV1000 PCBs are able to be reinitialized to factory default settings. This will also reset saved high scores on games that have no reset high score function, like Mushihimesama and Espgaluda II.

To reinitialize a PCB, users must:
Remove the battery.
If using U10, short Pin 9 (DO) a GND. If using U13, short the fourth pin from the right on the bottom row to a GND. Users only need to short one of the two pins, not both.
While shorted, power on the PCB until the EEPROM test.

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Cave CV1000D (2008–2012)
The CV1000-D is a direct upgrade of the Cave CV1000B board, the main differences seem to be;
Chip U1: IS42S32400D 128Mb SDRAM @ 166mhz (standard SH3 has MT48LC2M32 64Mb SDRAM).
Chip U4: 32Mbit Spansion S29JL032H (standard SH3 has a 16Mbit Spansion S29AL016D.
No Lithium Battery.

Cave PC Based (2009)
CPU: AMD Athlon 64 X2 5050e Brisbane 2.60GHz, 1024KB L2 Cache
GPU: Radeon 3200 (built into the motherboard)
RAM: 2048MB (2GB) 800MHz DDR
Motherboard: ASUS M3A78-EM Socket AM2+/AM2, Micro ATX format

CD Express

Cubo CD32 (1995-1999)
The CUBO CD32 is an arcade machine, based around the Amiga CD32. Apparently it was designed and made by an Italian firm based in Milan called CD Express.

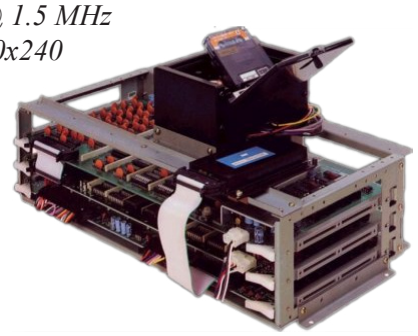
The CD32 contains additional expansion boards which are used to interface with the controls of the arcade unit. The Arcade unit configures itself by the means of the keyboard port and the coin mechanism is translated into the control pads left and right keys.

Only a small number of games were developed for the Cubo CD32, mostly with italian localization. Amongst the software specifically produced for the CUBO CD32 is Candy Puzzle, and Italian black jack game and a french 10000 question photo quiz.

"bigbookofamigahardware.com"

Data East

DECO Cassette System (1980–1985)
CPU: M6502 @ 750 kHz, M6502 @ 500 kHz, I8X41 @ 500 kHz
Sound: 2x AY-8910 @ 1.5 MHz
Video Resolution: 240x240
until



The DECO Cassette System was introduced in December 1980 by Data East. It was the first standardised arcade system that allowed arcade owners to change games.

The arcade owner would buy a base cabinet, while the games were stored on standard audio cassettes. The arcade owner would insert the cassette and a security dongle into the cabinet. When the cabinet was powered up, the program from the tape would be copied into the cabinet's RAM chips; this process took about two to three minutes. After this, the game could be played freely until the cabinet was rebooted.

It was revolutionary for its time, but arcade owners complained about the potential unreliability of the cassettes (which could be demagnetized easily), as well as the medium's standard load times.

DECO Laserdiscs (1983-1985)
The DECO Laserdisc was launched by Data East in 1983 , and use Laserdisc technology to host interactive movies with great visual quality for the time, but with a very limited gameplay, because the images are videos previously recorded, and not graphics generated in real time.

The system has a central M6502 processor. For the audio, the M6502 is intended, along with two AY-8910, and the Laserdisc reader was either the Sony LDP-1000 or the Sony LDP-1000A.

Three titles created by Data East: Bega's Battle/Genma Taisen, Cobra Command/Thunder Storm and Road Blaster/Road Avenger .

DECO 8-bit (1986-1988)

DECO 16-bit (1987-1990)

DECO 32-bit (1991-1995)

DECO Simple 156 (1993–1996)
CPU: ARM @ 28MHz
Audio: YMZ280B @ 14MHz

DECO MLC System (1995–1996)

There are avid collectors who seek out DECO cabinets and cassettes, but that's a tricky machine to collect for. As operators complained about failing tapes only months after the original purchase... 30 years can be even more devastating to this analog media. Additionally, you need the security dongle to make the games function. Finding all of these separate components is no easy task when the cabinets have been dormant for decades.

Collecting for DECO requires a lot of components just to get a single game running. Of course video game collecting is a labor of love! For those without such tenacity, many of the DECO games can be enjoyed via emulation on MAME.

"8-bitcentral.com"

Eolith

Eolith System (1998–2001)

Eolith 16-bit (1999)

Eolith Vegas (2002)

Eolith Ghost (2003–2005)

Examu

eX-BOARD (2008-2010)
CPU: Fanless Via C7 NanoBGA2
Chipset: Via CN700, VT8237R Plus
Memory: 1GB DDR2 SDRAM (with VRAM sharing)
Video: Integrated S3 UniChrome Pro AGP graphics with MPEG-2 decoding acceleration
VideoResolution: 15/31k
Audio: VIA VT1618Cidec 192KHz/32bit 8 channel AC'97
Network: RJ-45 10/100Mbps ethernet
Video I/O: JAMMA output; D-Sub 15-pin X 2/composite terminal/terminal
S-Video (able to connect simultaneously).
Sound I/O: JAMMA output/ left/right voice output terminal X 2
Input: Operators are able to add buttons with JAMMA input
USB: Two USB 2.0 ports
Power: JAMMA supply 12V 5A; or special power supply adaptor with AC100-240V 50/60Hz 1.7A
Operating System: Microsoft Windows XP Embedded
Flash Disk: 512MB/1GB/2GB
Examu, formerly known as Yuki Enterprise, is a Japanese video game company created in 2007 who mostly produces fighting games for arcades and home consoles. Initially, they developed games for their own arcade system board called eX-BOARD, to then release their games almost exclusively on Taito's NESiCAxLive arcade delivery system. Support for eX-BOARD ceased in December, 2013.

Fuuki

FG-2 (1995–1996)
Main CPU: Motorola 68000 @ 16 MHz
Sound CPU: Zilog Z80 @ 6 MHz
Sound Chips: Yamaha YM2203 @ 4 MHz + Yamaha YM3812 @ 4 MHz + OKIM6295 @ 1.056 MHz
Fuuki FG-2 System is a 16-bit Arcade System manufactured by Fuuki.

FG-3 (1998–2000)
Main CPU: Motorola 68EC020 @ 20 MHz
Sound CPU: Zilog Z80 @ 6 MHz
Sound Chip: Yamaha YMF278B @ 33.8688 MHz + Yamaha YMF262 @ 14.260547 MHz (Integrated in the OPL4)
Fuuki FG-3 System is a 32-bit Arcade System manufactured by Fuuki.

Gaelco

Gaelco are one of the only companys outside of the "big boys" who develop and use their own custom hardware instead of using generic systems. They're all slightly different and seem to evolve from game to game, even if nothing much is known about them individually.

Gaelco GAE1 (1994)

Gaelco GAE2

Gaelco GG-1v (1998)

Gaelco 3D (1996–1998)

Gaelco PowerVR Based (1999-2002)

Gaelco PC Based (2003–2005)

ICE

Innovative Concepts in Entertainment (ICE) has been a manufacturer of amusement and arcade games since 1982. Today, ICE carries one of the largest product ranges in the coin operated industry.

VP101 (2002-2004)

International Games System

PolyGame Master (1997–2005)
Main processor: Motorola 68000, running at 20 MHz
Sound processor: Zilog Z80, running at 8.468 MHz
Sound chip: ICS2115; 32 channel PCM
Protection chip: ARM7 ASIC with internal code, running at 20 MHz
Hardware features: 1 scrolling 8×8 tiles 4bpp scrolling tilemap, 32×32 tiles 5bpp scrolling tilemap with line-scroll, arbitrary size 5bpp sprites, zoom and shrink capabilities
The IGS PolyGame Master is an arcade system released by IGS in 1997. Designed to rival the SNK Neo Geo MVS, it borrows many design elements from the MVS, such as a cartridge system. Later on in the IGS PGM life cycle, some games were released in both cartridge form and single PCB form, similar to the MVS single PCB games.

IGS also allowed Cave to release games on a custom single PCB version of the PGM, known as the CAVE IGS PGM Hardware.

"wiki.arcadeotaku.com"

PolyGame Master 2 (2007–2011)
Main processor: IGS036 (differs per game, internal code)
Graphic processor: IGS037
Sound chip: Yamaha YMZ774-S
Protection chip: R5F21256SN (extra MCU for protection and IC Card communication)
Media: ROM (Custom program ROM module (KOV3 only))
The IGS PolyGame Master 2 is the successor to the IGS PolyGame Master, released in 2007.

IGS PGM and IGS PGM 2 games are not interchangeable. Only Oriental Legend 2 was released in Japan and instead of a motherboard/cartridge combo, it is an all in 1 PCB without card reader functionality.

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PolyGame Master 3 (2012)
Main processor: Dual Core Intel Atom Processor
Chipset: Intel D525 + ICH8M
RAM: 2 GB
Resolution: 31KHz
Media: SD Card (capacity max to 1 GB)

IGS PC Based (2004–)

Incredible Technologies

Incredible Technologies 8-bit Hardware (1988-1992)
CPU: M6809 @ 2MHz
Sound CPU: M6809 @ 2MHz
Sound FM Chip: YM2203 @ 4MHz or YM3812 @ 4MHz (depending on game)
Sound ADPCM Chip: MSM6295 or DAC (depending on game)

Incredible Technologies 32-bit Hardware (1992-2002)
CPU: MC68000 @ 12MHz or MC68EC020 @ 25MHz (depending on game)
Sound CPU: M6809 @ 2MHz
Sound Chip: Ensoniq ES5506 @ 16MHz

Incredible Technologies Eagle Hardware (1999-2005)

Incredible Technologies PC Based Hardware (2005-)

Interpark

NEXUS 3D (2006-2007)
CPU: 32bit RISC Microprocessor(ARM920T CPU core)
Main Memory: 128MBytes(Maximum 256MBytes) DDR-SDRAM
Supports Multiple Screen Resolution: 320x240, 640x480, 800x600, 1024x768, etc.
Rendering Performance : 100 Millions Pixels Per Second Fill Rate, 1 Millions Triangles Per Second Rendering, 1434 rectangles per sec(256x256 16bit objects)
Supports MPEG4 SP and MJPEG format of AVI files
Sound: Internal Audio Engine or External System Available, TDA1519(Philips) Stereo Power AMP(22 Watt)
Board Feature: JAMMA Standard

Irem

Irem M-10/M-15 (1979-1980)
CPU: 6502 @ 2.5 MHz

Irem M-27 (1980-1981)
CPU: 6502
Sound Chip: AY-3-8910

Irem M-52 (1982-1983)
CPU: Z80 @ 3 MHz (or 4 MHz depending on game)
Sound CPU: M6803 @ 894.886 kHz
Sound Chip: 2 x AY-3-8910 @ 894.886 kHz, 2 x MSM5205 @ 384 kHz

Irem M-62 (1984-1986)
CPU: Z80 @ 4MHz
Sound CPU: M6803 @ 894.886 kHz
Sound Chip: 2x AY-3-8910 @ 894.886 kHz, 2x MSM5205 @ 384 kHz
The Irem M62 hardware, is a 8-bit arcade system board manufactured by Irem.

Irem M-63 (1984-1985)
CPU: Z80 @ 4 MHz
Sound CPU: i8039 @ 533.333 kHz
Chip: 2 x AY-3-8910 @ 894.886 kHz
The Irem M63 hardware, is a 8-bit arcade system board manufactured by Irem.

Irem M-72 (1987-1990)
CPU: V30 @ 8 MHz
Sound CPU: Z80 @ 3.579545 MHz
Sound Chip: YM2151 @ 3.579545 MHz

Irem M-73 (1991)

Irem M-75 (1988)
CPU: Z80 @ 3.579645
Sound CPU: Z80 @ 3.579645
Sound Chip: YM2151 @ 3.579645

Irem M-77 (1988)
CPU: Z80 @ 3.579645
Sound CPU: Z80 @ 3.579645
Sound Chip: YM2151 @ 3.579645

Irem M-81 (1989-1990)
CPU: V30 @ 8 MHz
Sound CPU: Z80 @ 3.579545 MHz
Sound Chip: YM2151 @ 3.579545 MHz
Similar base hardware to M72, but all with slight differences. It seems to be an more integrated version.

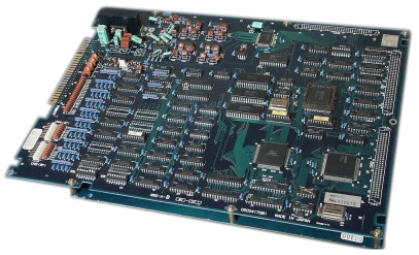
Irem M-82 (1989-1990)
CPU: V30 @ 8 MHz
Sound CPU: Z80 @ 3.579545 MHz
Sound Chip: YM2151 @ 3.579545 MHz
Similar base hardware to M72.

Irem M-84 (1989-1991)
CPU: V30 @ 8 MHz
Sound CPU: Z80 @ 3.579545 MHz
Sound Chip: YM2151 @ 3.579545 MHz
Similar base hardware to M72.

Irem M-85 (1990)
CPU: V30 @ 8 MHz
Sound CPU: Z80 @ 3.579545 MHz
Sound Chip: YM2151 @ 3.579545 MHz
Similar base hardware to M72.

Irem M-90 (1991)
CPU: V30 @ 8 MHz
Sound: Uses M72 sound hardware.
Sound CPU: Z80 @ 3.579545 MHz
Sound Chip: YM2151 @ 3.579545 MHz
Video: NANAO GA-25 (2 tilemaps and sprites)
There is 1 video chip, a NANAO GA-25, it produces 2 tilemaps and sprites.

Irem M-92 (1991-1994)
CPU: V33 @ 9 MHz, V30 @ 7.159090 MHz
Sound Chip: YM2151 @ 3.579545 MHz, GA20 @ 3.579545 MHz
Other Chip: GA21, GA22



The M92 is made from a top and bottom board, the top (main) board is common across the games, but the bottom (game) board can vary game to game.
The sound cpu and the sprite chip are on the game board rather than the main board and can differ between games. Each game has an encrypted sound cpu. Hardware abilitys include 3 scrolling playfields, 512 by 512. Each playfield can enable rowscroll, change shape (to 1024 by 512), be enabled/disabled and change position in VRAM.

Irem M-97 (1992-1993)
CPU: V30 @ 8 MHz
Sound CPU: Z80 @ 3.579545 MHz
Sound Chip: YM2151 @ 3.579545 MHz

Irem M-107 (1993-1995)
CPU: V33 @ 14 MHz, V30 @ 7.159090 MHz
Sound Chip: YM2151 @ 3.579545 MHz, GA20 @ 3.579545 MHz
The board is close to M92 hardware, but with 4 playfields instead of 3 and twice as many colours and sprites.

The last game produced by Irem on arcades the japanese revisions of Dream Soccer ‘94, runs on Irem M92 hardware.

Jaleco

Mega System 1 (1988-1993)
Main CPU:
Mega System 1-A/Z: Motorola 68000 @ 6 MHz
Mega System 1-B/D: Motorola 68000 @ 8 Mhz
Mega System 1-C: Motorola 68000 @ 12 Mhz
Sound CPU:
Mega System 1-A/B/C: Motorola 68000 @ 7 MHz
Mega System 1-Z: Zilog Z80 @ 3 MHz

Sound Chips:
Mega System 1-A/B/C: Yamaha YM2151 @ 3.5 MHz + 2xOKIM6295 @ 4 MHz (Hayaoshi Quiz Ouza Ketteisen happens to have the OKIM6295 chips clocked at 2 MHz instead)
Mega System 1-D: OKIM6295 @ 2 MHz
Mega System 1-Z: Yamaha YM2203 @ 1.5 MHz
board
Jaleco Mega System 1 (Also known as Mega System 1 and as Jaleco Concept Board Mega System 1) is a 16-bit Arcade System produced by Jaleco.

Mega System 32 (1993–1997)
Main CPU: NEC V70 @ 20 MHz
Sound CPU: Zilog Z80 @ 4 MHz
Sound Chip: Yamaha YMF271-F @ 16.9344 MHz
Jaleco Mega System 32 (Also known as Mega System 32, Jaleco Motherboard Mega System 32 and Jaleco Concept Board Mega System 32) is a 32-bit Arcade System manufactured by Jaleco.

Jaleco Tetris Plus 2 (1997-2000)

Kaneko

Kaneko 16-bit (1991-1995)

Super Kaneko Nova System (1996–2002)
CPU: SH2 @ 28.63 MHz
Sound Chip: YMZ280B @ 16.666 MHz
Regions are not cross compatible and have their own BIOS. The region Regions by color coded cart:
White = Japan
Light Blue = Europe
Dark Blue = USA
Green = Asia
Red = Korean

Konami

Konami Dual 68000 Based Hardware (1986-1988)
Main CPU: 2 x 68000

Konami Blades Of Steel Based Hardware (1986-1987)
CPU: 6309
Video Chips: 007342 007420 007327

Konami Xexex Based Hardware (1990-1994)
Video Hardware: 054157 054156 053247 053246 053251 (with a few noted exceptions)
The games released are all on slightly different hardware. They share a lot of common components, but they all have their own slight variations.

Konami Chequered Flag Based Hardware (1987-1992)
Video Chips: 051960 051937 051316

Konami Twin 16 (1987-1989)
Main CPU: 2 x 68000 @ 10MHz
Sound CPU: Z80
Sound chip: Yamaha 2151 + 3012, UPD7759C and a 007232 Konami Custom Chip

Bubble System (1985)
Main CPU: MC 68000 @ 10Mhz / G400 BIOS
Sound CPU: Z80
Sound chip: 2 x AY-3-8910 psg
Interface Harness: Scramble
The Bubble System introduced a unique new form of data storage for arcade-style video games. It used bubble memory cartridges, a sort of non-mechanical magnetic storage system. It was said to have a higher reliability than mechanical floppy disks or tape drives. Konami used a modified version of their new G400 BIOS for this project. The main CPU was a Motorola 68000 at 10 MHz. There was a separate Zilog Z80 for sound control, which drove two AY-3-8910s, a custom Konami SCC (K005289), and a Sanyo VLM5030 speech synthesizer. It had a Scramble wiring harness.

Bubble Software can be identified by its booting sequence; it displays "WARMING UP NOW - PRESENTED BY KONAMI" on screen, accompanied with a countdown timer and a small musical tune (called the "Morning Music"). The reason this was implemented was because bubble memory must be heated to around 30–40 °C (86–104 °F) for it to work properly.

Unfortunately, the Bubble System became a commercial failure because it was considerably more expensive than ROM chip-based boards and extremely sensitive to electromagnetic fields; which could easily render the game unplayable. Most games on this system were eventually ported to standard ROM chips, and it was discontinued. Still, Konami has made homages to the Bubble System in several games; with the Morning Music being one of the playable tracks in Keyboardmania and NOSTALGIA, and the intro of Konami Classics Series: Arcade Hits featuring the song too.

Games released include; Gradius (ported to ROM chips as Nemesis for overseas distribution), TwinBee, Galactic Warriors and Konami RF2 (ported to ROM chips as Konami GT for overseas distribution).

Anyone who still has one of these systems in their possession and still has it working today is incredibly lucky...

Konami GX400 (1985-1987)
Main CPU: Motorola 68000 @ 9.216 MHz
Sound CPU: Zilog Z80
Sound Chip: 2x AY-3-8910 PSG or YM2151, VLM5030 and K007232

Mystic Warriors Based Hardware (1993)
CPU: 68000
Video Hardware: 054157 054156 055673 053246 055555
Mystic Warriors-based hardware is an arcade system board used by Konami on several of its 1993 fighting games. Since Konami did not use the word system on most of its arcade hardware, its arcade games are usually classified by the type of video and sound chips used (in this case, the hardware is named after Konami's ninja-themed run-and-gun game, Mystic Warriors).

Konami GX (1994–1997)
Main CPU: 68EC020 @ 24MHz
Sound CPU: 68000 @ 16MHz
Konami GX is a 32-bit Arcade System. There are actually 2 revisions of GX motherboard, they are totally interchangable and the Version 2 motherboard is just smaller, has 1 fewer custom chips, was cheaper to produce, cooler and used less power.
Ver. 1 Motherboard:
Graphics chips : 54156, 56832, 55555, 53246, 055673, 54338
Sound chip: 056800, 2 x 054539 (PCM, 8 Ch) and TMS57002 (effects DSP)
Ver. 2 Motherboard:
Graphics chips: 58143, 56832, 55555, 58142, 55673, 58144. (58143 replaces 54156, 58142 replaces 53246, 58144 replaces 54338. All are completely compatible with their predecessors, just smaller)
Sound chip: 056800, 058141, TMS57002 (58141 is 2 x 54539s on one smaller chip)

Konami GQ (1995)
Main CPU: R3000A 32 bit RISC processor, Clock - 33.8688MHz, Operating performance - 30 MIPS, Instruction Cache - 4KB
Sound CPU: 68000 @ 16MHz
Sound chip: 2 x 054539 (PCM, 8 Channels) and TMS57002 (effects DSP)
BUS: 132 MB/sec.
OS ROM: 512 Kilobytes
Additional Sound Chips: Playstation SPU, 24 Channels, 44.1KHz sample rate, PCM audio source, Digital effects include: Envelope, Looping, Digital Reverb, Load up to 512K of sampled waveforms, Supports MIDI Instruments.
Main RAM: 2 Megabytes
Video RAM: 2 Megabyte
Sound RAM : 512 Kilobytes
Graphical Processor: 360,000 polygons/sec, Sprite/BG drawing, Adjustable frame buffer, No line restriction,

4,000 8x8 pixel sprites with individual scaling and rotation, Simultaneous backgrounds (Parallax scrolling)
Sprite Effects : Rotation, Scaling up/down, Warping, Transparency, Fading, Priority, Vertical and horizontal line scroll
Resolution: 256x224 - 740x480
Colours: 16.7 million colors, Unlimited CLUTs (Color Look-Up Tables)
Other Features: custom geometry engine, custom polygon engine, MJPEG decoder
Roms: SCSI Hard-Drive Based

The Konami GQ System is a 32-bit arcade system board manufactured by Konami. The board uses the Sony PlayStation hardware, with some improvements.

Konami ZR-107 (1995–1996)
CPU: PowerPC 403e 32-bit RISC @ 32 MHz
3D DSP: Analog Devices ADSP-21062 (SHARC) 32-bit floating point DSP @ 36 MHz
Sound CPU: 68000 @ 8 MHz
Sound Chip: K058141 (equivalent to 2xK054539)
2D Graphics: K056832, K058143
3D Graphics: K001005, K001006

Konami Baby Phoenix / GV System (1996–2000)
Main CPU: R3000A 32 bit RISC processor, Clock - 33.8688MHz, Operating performance - 30 MIPS, Instruction Cache - 4KB
BUS: 132 MB/sec.
OS ROM: 512 Kilobytes
Additional Sound Chips: Playstation SPU, 24 Channels, 44.1KHz sample rate, PCM audio source, Digital effects include: Envelope, Looping, Digital Reverb, Load up to 512K of sampled waveforms, Supports MIDI Instruments.
Main RAM: 2 Megabytes
Video RAM: 1 Megabyte
Sound RAM: 512 Kilobytes
Graphical Processor: 360,000 polygons/sec, Sprite/BG drawing, Adjustable frame buffer, No line restriction, 4,000 8x8 pixel sprites with individual scaling and rotation, Simultaneous backgrounds (Parallax scrolling)
Sprite Effects: Rotation, Scaling up/down, Warping, Transparency, Fading, Priority, Vertical and horizontal line scroll
Resolution: 256x224 - 740x480
Colours: 16.7 million colors, Unlimited CLUTs (Color Look-Up Tables)
Other Features: custom geometry engine, custom polygon engine, MJPEG decoder
Roms: SCSI CD Based

Baby Pheonix was the USA designation for this hardware.

Konami GTI Club (1996–1997)
CPU: PowerPC 403GA @ 64 MHz
3D DSP: ADSP-21062 (SHARC) @ 36 MHz
Sound CPU: 68EC000 @ 16 MHz
Sound chips: Ricoh RF5C400 PCM 32Ch, 44.1 kHz Stereo, 3D Effect Spatializer.
Graphics (Custom 3D): 2 x KS10071 (Possibly graphics as well: KS10081, K001604)
Unknown Chips (possibly sound related): K056800, K056230

Konami M2 (1997–1998)
Main CPU: 2 x IBM PowerPC 602 EMPPC602FB66 Custom ASICs
BDA: Memory control, system control, and video/graphic control. Full triangle renderer including setup engine, MPEG-1 decoder hardware, DSP for audio and various kinds of DMA control and port access. Random access of frame buffer and z-buffer (actually w-buffer) possible at the same time.
CDE: Power bus connected to BDA and the two CPUs, "bio-bus" used as a low-speed bus for peripheral hardware
*Renderer capabilities: 1 million un-textured triangles/s geometry rate. 100 million pixels/s fill rate. Reportedly 700,000 textured polygons/s *without* gouraud shading or additional effects. Reportedly 300,000 to 500,000 textured polygons/s *with* gouraud shading, lighting and effects.*
Shading: flat shading and gouraud shading, texture mapping, decal, modulation blending, tiling (16K/128K texture buffer built-in). Hardware z-buffer (16-bit) (actually a block floating point with multiple (4) range w-buffer), object-based full-scene anti-aliasing, alpha channel (4-bit or 7-bit)
Resolution: 320x240 to 640x480 resolution at 24-bit color
Sound hardware: 16-bit 32-channel DSP at 66 MHz (within BDA chip)
Media: Quad-speed CD-ROM drive (600 KB/s)
RAM: Unified memory subsystem with 8 MB/s, 64-bit bus resulting in peak 533 MB/s bandwidth, Average access 400 MB/s.
Full Motion Video: MPEG-1
Writable Storage: Memory cards from 128 KiB to 32 MiB
Expansion Capabilities: 1 PCMCIA port (potentially used for Modems, Ethernet NICs, etc.)
Roms: 8x CD Rom LW and Rom Bios

The Panasonic M2 was a video game console design developed by 3DO and then sold to Matsushita. Initially announced as an add-on chip for the 3DO Interactive Multiplayer, it was later unveiled as a standalone console. The console was cancelled in 1997, but the M2 technology was incorporated into other devices.

Development kits and prototypes of the machine became very valuable pieces among collectors. M2's technology was integrated in the multimedia players FZ-21S and FZ-35S, both released in 1998. Both products were aimed at professionals working in medicine, architecture and sales, not home users. The M2 also became a short-lived arcade board by Konami. The agreement to develop the board was made well in advance of the M2 console's planned release date, with the understanding that games using the arcade board would be ported to the home console, similar to the relationship between the PlayStation and Namco System 11. As games ran straight from the CD-ROM drive, it suffered from long load times and a high failure rate, so only five games were developed for it; Battle Tryst, Evil Night/Hell Night, Heat Of Eleven '98, Polystars and Total Vice.

The M2 technology was later used in automated teller machines, and in Japan in coffee vending machines. In the late 1990s and from 2000 on, the system was also sold in the interactive kiosk market. In 2000, PlanetWeb, Inc. began offering software to allow the M2 to be used as an Internet appliance.

Konami Cobra System (1997)
Main CPU: PowerPC 603e @ 100 MHz
Sub CPU: PowerPC 403GA @ 33 MHz
Graphics CPU (transform & lighting): PowerPC 604 @ 100 MHz
Sound CPU: 68EC000 @16 MHz
Sound Chip: Ricoh RF5C400 PCM 32 Channel, 44.1 kHz Stereo Output, 3D Effect Spatializer + TMS57002 effects DSP
Video Board: Custom IBM OpenGL board based on graphics options for the RS/6000 series workstations
Video resoution: 640 x 400 Pixels + Mini LCD Screen Capability
Colours: 16 bit Color x 2
Raster System: 144 bits/pixel Frame Buffer including 16 bit Color x 2, 8 bit Alpha, 32bit Depth (Floating Point Z-buffers), 12 bit Stencil, 256 Level alpha Blending, Polygon & Wire Frame Rasterization

Rendering: 1-5 Million Polygons/sec, 50-250 Million Pixels/sec,
Capabilitys: Anti-aliasing by Subpixel Sampling, Flat Shading, Gouraud Shading, Up to 8 Light Sources consisting of parallel light , point light, & spot light, Linear Fog, Exponential Fog, Particle Emulation, 6 Clip Planes, Mapping with Perspective Correction, Mipmap Support ,Bilinear & Trilinear Filtering, Real-time Texture Loading System
Other: 100meg High Speed Network Communication
Technically, the Cobra System is an update from the Konami Hornet Hardware, but with much more expensive components, resulting in great graphic improvement. The only game released was Fighting Bujutsu: Wu-Shu.

Bemani DJ-Main (1997–2002)
CPU: MC68EC020FG25 @ 25MHz
Custom Chips: 058143, 056832, 055555, 056766, 058141, and KS10101
Sound: Custom Konami Sound Chips for Multiple Sound Channels
Resolution: 24kHz 512x384
Drives: Pop'N Music use 3.5inch IDE-HDD, all other games use 2.5inch.
Roms: Program and graphics on EEPROM.
The hardware is basically Konami GX with a harddrive.

Konami Hornet (1998–2000)
CPU: PowerPC 403GA 32-bit RISC @ 64 MHz
Sound CPU: 68000 @ 16 MHz
Sound Chip: Ricoh RF5C400 PCM 32Ch, 44.1 kHz Stereo, 3D Effect Spatializer
3D DSP: Analog Devices ADSP-21062 (SHARC) 32-bit floating point DSP @ 36 MHz
Graphics Chips: 3DFX Voodoo 2 Pixel processor with 16meg RAM, 3DFX Voodoo 2 Texture processor with 32meg RAM
Interface: Jamma +
The board can be run at either 15 kHz (low res) or 24 kHz (medium res). It looks very blocky in low res but means it is backwards compatible with older cabinets. To get the best out of the system it really needs a meduim res monitor as the detail is very impressive. There are no roms on the graphics boards, and there is a message "downloading data" on bootup.
Silent Scope uses 2 graphics boards instead of the one, the master board handles the main screen of the game at medium res, the slave graphics board runs at low res and outputs to the gun scope.

Konami NWK-TR (1998–1999)
Main CPU: Power PC403e 33MHz
Sound CPU: 68EC000 @16 MHz
Sound Chip: Ricoh RF5C400 PCM 32 Channel, 44.1 kHz Stereo Output, 3D Effect Spatializer
Video Boards: 4 x 3DFX Chips (2 for PixelFX and 2 for TexelFX) per board
3D Maths Chip: Analog Devices ADSP-21062 (SHARC) @ 40 MHz
Control Chip: AMD Mach 111 N676B1
Video resoution: 640 x 400 Pixels
Colours: 16 bit Color x 2
Raster System: 144 bits/pixel Frame Buffer including 24 bit Color x 2, 8 bit Alpha, 32bit Depth (Floating Point Z-buffers), 12 bit Stencil, 256 Level alpha Blending, Polygon & Wire Frame Rasterization
Rendering: 1-5 Million Polygons/sec, 50-250 Million Pixels/sec,
Capabilitys: Anti-aliasing by Subpixel Sampling, Flat Shading, Gouraud Shading, Up to 8 Light Sources consisting of parallel light , point light, & spot light, Linear Fog, Exponential Fog, Particle Emulation, 6 Clip Planes, Mapping with Perspective Correction, Mipmap Support ,Bilinear & Trilinear Filtering, Real-time Texture Loading System
Other: 100meg High Speed Network Communication

Konami System 573 (1998–2003)
Main CPU: R3000A 32 bit RISC processor, Clock - 33.8688MHz, Operating performance - 30 MIPS, Instruction Cache - 4KB
BUS: 132 MB/sec.
OS ROM: 512 Kilobytes
Additional Sound Chips: Playstation SPU, 24 Channels, 44.1KHz sample rate, PCM audio source, Digital effects include: Envelope, Looping, Digital Reverb, Load up to 512K of sampled waveforms, Supports MIDI Instruments.
Main RAM: 2 Megabytes
Video RAM: 2 Megabyte
Sound RAM: 512 Kilobytes
Graphical Processor: 360,000 polygons/sec, Sprite/BG drawing, Adjustable frame buffer, No line restriction, 4,000 8x8 pixel sprites with individual scaling and rotation, Simultaneous backgrounds (Parallax scrolling)
Sprite Effects: Rotation, Scaling up/down, Warping, Transparency, Fading, Priority, Vertical and horizontal line scroll
Resolution: 256x224 - 740x480
Colours: 16.7 million colors, Unlimited CLUTs (Color Look-Up Tables)
Other Features : custom geometry engine, custom polygon engine, MJPEG decoder
Roms: CD Based with a ROM key chip.
The board is PSX Based and up to 9 cabinets can be linked.

The System 573 is a series of arcade system boards by Konami based on the original PlayStation. The hardware was used primarily for Konami's Bemani series of music video game arcades, most commonly the Dance Dance Revolution series introduced in 1998. The System 573 is available in two variants with analog and digital I/O boards, dubbed the Bemani System 573 Analog and Bemani System 573 Digital respectively, along with a third variant called the System 573 Satellite Terminal which allows for up to 8 cabinets to be networked to a central one.

Bemani System 573 Analog (1998–1999)
System: Based on the PSX based System 573.
I/O Board: Digital I/O board GX894-PWB (B)A
Analog board gets audio directly from the audio output on the CD-Rom drive. Sound is also routed differently through the PCB compared to Digital board.
Main CPU: R3000A 32 bit RISC processor, Clock - 33.8688MHz, Operating performance - 30 MIPS, Instruction Cache - 4KB
BUS: 132 MB/sec.
OS ROM: 512 Kilobytes
Additional Sound Chips: Playstation SPU, 24 Channels, 44.1KHz sample rate, PCM audio source, Digital effects include: Envelope, Looping, Digital Reverb, Load up to 512K of sampled waveforms, Supports MIDI Instruments.
Main RAM: 2 Megabytes
Video RAM: 2 Megabyte
Sound RAM: 512 Kilobytes
Graphical Processor: 360,000 polygons/sec, Sprite/BG drawing, Adjustable frame buffer, No line restriction, 4,000 8x8 pixel sprites with individual scaling and rotation, Simultaneous backgrounds (Parallax scrolling)
Sprite Effects: Rotation, Scaling up/down, Warping, Transparency, Fading, Priority, Vertical and horizontal line scroll
Resolution: 256x224 - 740x480
Colours: 16.7 million colors, Unlimited CLUTs (Color Look-Up Tables)
Other Features: custom geometry engine, custom polygon engine, MJPEG decoder

Bemani System 573 Digital (1999–2004)
System: Based on the PSX based System 573.
I/O Board: Digital I/O board GX894-PWB (B)A
Digital board gets sound in digital format from the CD-Rom through the the IDE lead.
Sound is also routed differently through the PCB compared to Analog board.
Main CPU: R3000A 32 bit RISC processor, Clock - 33.8688MHz, Operating performance - 30 MIPS, Instruction Cache - 4KB
BUS: 132 MB/sec.
OS ROM: 512 Kilobytes
Additional Sound Chips: Playstation SPU, 24 Channels, 44.1KHz sample rate, PCM audio source, Digital effects include: Envelope, Looping, Digital Reverb, Load up to 512K of sampled waveforms, Supports MIDI Instruments.
Main RAM: 2 Megabytes
Video RAM: 2 Megabyte
Sound RAM: 512 Kilobytes
Graphical Processor: 360,000 polygons/sec, Sprite/BG drawing, Adjustable frame buffer, No line restriction, 4,000 8x8 pixel sprites with individual scaling and rotation, Simultaneous backgrounds (Parallax scrolling)
Sprite Effects: Rotation, Scaling up/down, Warping, Transparency, Fading, Priority, Vertical and horizontal line scroll
Resolution: 256x224 - 740x480
Colours: 16.7 million colors, Unlimited CLUTs (Color Look-Up Tables)
Other Features: custom geometry engine, custom polygon engine, MJPEG decoder
Flash Card:
All games used a 32meg flash card for the games program, the exception for this is the "Disney's Rave" machine, which for some reason uses a 16meg flash card, so if you want to upgrade you need to get your hands on a 32 meg card.
Drummania and Guitar Freaks can actually be linked together for "Jam" sessions.
Conversion:
The newer versions require some of the roms to be flashed on the mainboard when upgrading the machines. DDR5th Mix was possibly the first to do this. Upgrade kits for 5th Mix come with the System Disc and a security cartridge. To upgrade, Normally, for DDR, the system will boot to the CD, check the security cart, if the cart's empty, it'll overwrite the security cart and prompt a reboot. After the reboot, it'll check the security cart as normal and now as it's been written to will boot up normally. This was, among other things, to change the game system code so the game would run at 60 fps as opposed to 30 fps.
3rd Mix Notes.
How to tell what version of 3rd Mix the board is:
If the default song is 'Shock' then it is a 3rd Mix Korea Ver.2. Thist has 16 Korean songs on it, the drawback is that it's missing a few songs from both 3rd and 2nd Mix.
If the default song is Bakkwo then the board is a 3rd Korea. If you have ever played on a 3rd Mix Plus, 4th, or 4th Plus you will notice that these are the same seven songs on the other mixes.
Lastly if the default song is Upside Down then it's an asian 3rd Mix. Not only are there songs missing from the real Japanese version but there are 0 Korean songs as well.

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Konami TMNT Based Hardware (1988-1991)
Video Chips : 052109 051962 051960 051937 PROM

Konami TMNT 2 Based Hardware (1990-1993)
Video Hardware: 052109 051962 053245 053244 053251

Konami X-Men Based Hardware (1991-1992)
Video Chips: 052109 051962 053247 053246 053251

Bemani Twinkle (1999–2002)
Hardware: Playstation based but not system 573.
Main CPU: R3000A 32 bit RISC processor, Clock - 33.8688MHz, Operating performance - 30 MIPS, Instruction Cache - 4KB
BUS: 132 MB/sec.
OS ROM: 512 Kilobytes
Sound CPU: 68000
Sound Chip: RF5c400
Additional Sound Chips: Playstation SPU, 24 Channels, 44.1KHz sample rate, PCM audio source, Digital effects include: Envelope, Looping, Digital Reverb, Load up to 512K of sampled waveforms, Supports MIDI Instruments.
Main RAM: 2 Megabytes
Video RAM: 2 Megabyte
Sound RAM: 512 Kilobytes
Graphical Processor: 360,000 polygons/sec, Sprite/BG drawing, Adjustable frame buffer, No line restriction, 4,000 8x8 pixel sprites with individual scaling and rotation, Simultaneous backgrounds (Parallax scrolling)
Sprite Effects: Rotation, Scaling up/down, Warping, Transparency, Fading, Priority, Vertical and horizontal line scroll
Colours: 16.7 million colors, Unlimited CLUTs (Color Look-Up Tables)
Display : Display is composite TV so can use unlimited colors, but system uses CLUT due to overlay graphics only use 16k colors for background animation and 256 colours for flames and demo.
Other Features: custom geometry engine, custom polygon engine, MJPEG decoder
Storage Media: Combination of CD's, DVD's, Roms and Harddrive with a small ROM cartridge for protection.
JVC DVD player: DVD background movies.
Toshiba PD chip: Security chip.
SCSI CD-Rom drive: Program core and ingame graphics.
IDE Hard Drive: Audio.
Conversion:
All games can be converted to latest versions. Upgrade kits consist of 2 CD's, Security Chip, DVD, Hard-Drive, Manual and all associated stickers.

Bemani Firebeat (2000–2003)
CPU: IBM Power PC 403GCX
Graphics System: Konami custom (sprite style chip)
Sound: YMZ280B
Software: DVD Drive, CD-ROM drive & Dongle
Graphics: Can draw arbitrary sized images from VRAM, which is laid out like a 2D texture sheet, also all the images are packed 16-bit pixels so there's no palette.
Storage Media:
Beatmania III series: CD-ROM (Program & Data) & 3.5inch IDE-HDD(Audio)
Keyboardmania series: CD-ROM (Program) & CD-ROM (CD-DA Audio)
Pop'n music series: CD-ROM (Program) & DVD-ROM (Audio)
Para Para Paradise 1&1stPlus: CD-ROM (Program) & CD-ROM (CD-DA Audio)

Mem cards are compact flash and are packed to death, it holds everthing, and is fully transportable across boards through flash cards.
Some cabinets can actually be linked together for "Jam" sessions.

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Bemani GSAN1 (2000)
DanceDanceRevolution KIDS uses completely unique hardware, referred to as "GSAN1" after the model number silk-screened on the board, as the platform was never officially named. The quality of both graphics and sound in DanceDanceRevolution KIDS is far worse than any other game in the series due to the limitations of this hardware.

Konami Viper (2000–2005)
CPU: Motorola Power PC XPC8240 @ 200-250MHz
Graphics System: 3DFX 355-0024-020 (Equivalent to 3dfx Voodoo3/Avenger)
Sound: YMZ280B
ROMS: Flash Card based, some secured, and all controlled by an RTC Ram.
Mem cards are compact flash and are packed to death, it holds everthing, and is fully transportable across boards, through flash cards. The only one not transportable so far are Police 24/7 2, and Sogeki.

Konami Python (2001–2005)
CPU:
128 Bit "Emotion Engine"
System Clock: 300 MHz
System Memory: 32 MB Direct Rambus
Memory Bus Bandwidth: 3.2 GB per second
Co-Processor: FPU (Floating Point Multiply Accumulator x 1, Floating Point Divider x 1)
Vector Units: VU0 and VU1 (Floating Point Multiply Accumulator x 9, Floating Point Divider x 1)
Floating Point Performance: 6.2 GFLOPS
3D CG Geometric Transformation: 66 million Polygons Per Second
Compressed Image Decoder: MPEG2
Graphics:
"Graphics Synthesizer"
Clock Frequency: 150MHz
DRAM Bus bandwidth: 48 GB Per Second
DRAM Bus width: 2560 bits
Pixel Configuration: RGB:Alpha:Z Buffer (24:8:32)
Maximum Polygon Rate: 75 Million Polygons Per Second
Sound:
"SPU2+CPU"
Number of voices: ADPCM: 48 channel on SPU2 plus definable by software
Sampling Frequency: 44.1 KHz or 48 KHz (selectable)
I/O Processor:
CPU Core: Current PlayStation CPU
Clock Frequency: 33.8 MHz or 37.5 MHz (selectable)
Sub Bus: 32 BitConnection Format : JVS
Hardware is made up of a Konami main board (a bit like Viper) containing a couple of Konami chips, a flashROM, a couple of CPLDs and a heat sinked Toshiba TMPR3927. On top of that on another metal platform is a standard PS2 main board (the original PS2, old type square board) with the standard PS2 video cable plugged into it and into the main board, plus a power cable coming from the main Konami board into it and a small cable coming from the PS2 front connection board in a tiny connector joining to a connector on the main board. The front controller/memory card ports are present and in one of them is a Sony Magic Gate card which no doubt has a 16M flashROM and a secured PIC. Main game is stored on a 128M CF card which plugs into the Konami main board.

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Konami Bemani Viper (2003–2006)
CPU: Motorola Power PC XPC8240 @ 200-250MHz
Graphics System: 3DFX 355-0024-020 (Equivalent to 3dfx Voodoo3/Avenger)
Sound: YMZ280B
ROMS: Flash Card based, some secured, and all controlled by an RTC Ram.
Mem cards are compact flash and are packed to death, it holds everthing, and is fully transportable across boards, through flash cards. The only one not transportable so far are Police 24/7 2, and Sogeki.

Konami Bemani PC Based (2003–)
The hardware has various different PC configurations.

Konami PC Based (2004–)

The hardware is various configurations running Windows XP embedded with a protection dongle.

Konami Python 2 (2005–2007)
CPU:
128 Bit "Emotion Engine"
System Clock: 300 MHz
System Memory: 32 MB Direct Rambus
Memory Bus Bandwidth: 3.2 GB per second
Co-Processor: FPU (Floating Point Multiply Accumulator x 1, Floating Point Divider x 1)
Vector Units: VU0 and VU1 (Floating Point Multiply Accumulator x 9, Floating Point Divider x 1)
Floating Point Performance: 6.2 GFLOPS
3D CG Geometric Transformation: 66 million Polygons Per Second
Compressed Image Decoder: MPEG2
Graphics:
"Graphics Synthesizer"
Clock Frequency: 150MHz
DRAM Bus bandwidth: 48 GB Per Second
DRAM Bus width: 2560 bits
Pixel Configuration: RGB:Alpha:Z Buffer (24:8:32)
Maximum Polygon Rate: 75 Million Polygons Per Second
Sound:
"SPU2+CPU"
Number of voices: ADPCM: 48 channel on SPU2 plus definable by software
Sampling Frequency: 44.1 KHz or 48 KHz (selectable)
I/O Processor:
CPU Core: Current PlayStation CPU
Clock Frequency: 33.8 MHz or 37.5 MHz (selectable)
Sub Bus: 32 Bit
Software: Stored on a hard drive plugged into the PS2's hard drive adaptor port.
The hardware is a Playstation 2 (Model SCPH-50000 (MB/NH) - Japanese NTSC), with a hard drive and an adaptor board.

Limenko

Power System 2 (2000–2003)
CPU: Hypertone E1-32XN 32bit RISC clocked at 80 MHz 4
System Memory: 4Mbyte
Display:
Hyper2D ASIC VDP (Video Display Processor)
60 frames per second
16 bit color, 256 true color
4 simultaneous display processing
DMA data processing palette
Resolution: 384 x 240
The Power System 2 is JAMMA compatible. It works of a motherboard containing the arcade system, while the games are stored on cartridges. The system uses a central processor Hyperstone E1-32XN (Risc), and a QSSP QS1000 to manage sound. The hardware can network two terminals of Legend of Heroes to allow a game with four players 3 .

Metro Corporation

Metro System (1992-2000)

MicroProse

MicroProse 3D Hardware (1990-1993)
Host PCB :
Main processor:
68000P12
MC68681P (UART)
MC68901P (peripheral)
Numerous PLDs (9 PAL/GALs)
The Host PCB is where the program CPU is located and where the game I/O is connected to. The host PCB decompresses the game objects into RAM on power-up after a self test. The compressed object information is located in the ROMs at locations U69, U70, U71, U93, U94, and

U95. There is an RS232 port for debugging via an external computer, as well as an RS232 port for communication to the Audio PCB.
Dr Math PCB :
CPU: AM29000-16 (32bit RISC microprocessor, 4 stage pipeline)
Co-processor: AM29C323GC (32x32 bit floating point multiplier, parallel)
4 x - SDT7134 (44 pin PLCC, custom CPLDs ?)
MAC1 U173A - SAM448-20 (UV erasable microprogram sequencer)
MAC2 U166A - SAM448-20 (UV erasable microprogram sequencer)
Z85C3010VSC (communications controller, Zilog)
DS1228 (RS232 port for debug)
Numerous PLDs (13 PAL/GALs)
Video Generator PCB :
CPU - TMS34010 (40MHz graphics system processor)
9027EV (VLSI MPG, VGT8003-2148)
9027EV (custom, VLSI MPG, VGT8007-2105)
BT101KC30 (8-bit digital to analog converter)
6 x - TC110G38AF (custom, 100MW002-320)
3 x - SDT7134 (44 pin PLCC, custom CPLDs ?)
4 x - AM2701-50JC (?)
SCN2651CC1N28 (communications interface, for debug)
DS1228 (RS232 port for debug)
Number PLDs (13 PAL/GALs)
Audio PCB :
CPU : SC80C31BCCN40 (microcontroller, 11.0592MHz, 8051 family)
upD7759C (speech synthesizer, ADPCM)
2 x - SSM2047 (sound generator circuit)
DS1267 (digital potentiometer)
SSM2300 (sample and hold amplifier)
LC7528CN
YM2151
YM3012
ICL232CPE (RS232 port for communication to Host PCB)
Audio out is stereo
Games include; B.O.T.S.S./Battle Of The Solar System, Battle Tank/Super Tank Attack and F-15 Strike Eagle.

Midway

Astrocade (1982-1985)
Main CPU: Z80 @ 1.789773
Sound: Astrocade

MCR (1981)
Main CPU: Z80 @ 2.496 MHz
Sound CPU: Z80 @ 2 MHz
Sound chip: 2 x AY8910
Resolution: 512 x 480
The MCR CPU Board (Midway part number A084-91399-A968) is a Z-80 based microcomputer consisting of EPROM program and graphics memory, general purpose SRAM, high speed RAM for video, a custom video timing generation system, and I/O subsystems and decoding.

Bally Midway's MCR games were special in that most of the games designed required unique controls. This developers expanded the controls horizon, rather than limiting themselves to the simple joystick and button format of the era. MCR games had a lot of controls which one don't see often on other games. The description of some of these controls follows:
Trigger joystick: A joystick which has a button built in. This design left the player with a free hand to work other controls.
Tri-level encoder wheel: This is not only an encoder wheel that goes left and right, but can be pulled UP or DOWN. Basically, the encoder wheel is stable, but the shaft going through the wheel can be pulled up or down to press either of two leaf switches.
Bi-directional trackball (roller): A trackball which had an axis running through it, allowing it to only go in two directions. Basically just a fancy encoder wheel.
Other examples of unique controls includes Spy Hunter's, Two Tigers' and Tapper's set up.

"Mark Jenison & Clay Cowgill@mikesarcade.com"

MCR II (1981-1984)
Main CPU: Z80 @ 2.5 MHz
Sound CPU: Z80 @ 2 MHz
Sound chip: 2 x AY8910
Resolution: 512 x 480

MCR III (1983-1985)
Main CPU: Z80 @ 5 MHz
Sound: Individual for each games.
Resolution: 512 x 480

MCR-68K (1984-1990)
Main CPU: 68000 @ 7.6524
Sound: Individual for each games.
Resolution: 512 x 480

Y-Unit (1991-1992)
Main CPU: TMS34010 @ 6.25 MHz
Sound: Individual for each games.

T-Unit (1992-1994)
Main CPU: TMS34010 @ 6.25 MHz
Sound CPU: M6809 @ 2 MHz
Sound chip: YM2151 @ 3.57958 MHz, OKI 6295 @ 8 KHz, DAC
Mortal Kombat II uses the DCS Sound System (ADSP2105 @ 10 MHz and a DMA-driven DAC).

Wolf Unit (1994-1997)
Main CPU: TMS34010 @ 6.25 MHz
Sound CPU: ADSP 2105 @ 10 MHz
Sound chip: DCS Sound System.

X-Unit (1994)
Main CPU: TMS34020 @ 10 MHz
Sound CPU: ADSP2105 @ 10 MHz
Sound chip: DCS Sound System
Revolution X use this board.

V-Unit (1994-1997)
Main CPU: TMS32031 @ 50 MHz
Sound CPU: ADSP 2105 @ 10 MHz (ADSP-2115 @ 16MHz for WarGods)
Sound chip: DCS Sound System

Killer Instinct Hardware (1994-1995)
Main CPU: SDT79 R4600-100MS @ 50MHz
Sound: DCS Sound System (ADSP-2105 @ 10MHz)
Storage: Roms for the program and sound, Graphics streamed directly off of the Harddrive.

Killer Instinct was the first arcade game to use an internal hard disk drive in addition to the game's ROMs. This allowed it to store massive amounts of data thereby giving it the ability to have more detailed graphics than other games of this genre. The game used pre-rendered sprites for characters, created with Silicon Graphics computers and the backgrounds were pre-rendered as a "movie" which simply adjusted frames based on the players' current location. Killer Instinct's R4600 processor was clocked at 100 MHz. Unlike most arcade games of the time, Killer Instinct did not display which version number of the game is being played.

Midway Seattle (1997-1999)
Main CPU: MIPS R5000 @ Either 144MHz/150MHz/192MHz/200MHz (system clock 48MHz/50MHz)

System Memory: 8MB, 512KB Boot ROM.
Graphics: 3DFX FBI with 2MB frame buffer, 3DFX TMU with 4MB texture memory.
Sound CPU: DCS Sound System (ADSP 2115 @ 16MHz)
Sound Memory: 4MB DRAM, 32KB Boot ROM.
Other Chips: Galileo GT64010 system controller, National Semiconductor PC87415 IDE controller, Midway I/O ASIC.
Board composition: Main PCB and Hard Drive.
Hardware Features: Textured 3D, all normal 3DFX features.
There are actually 4 types of Seattle board systems, with varying speeds, They will interchange but if a 200Mhz game is on a 150 Mhz board, it will run slow during high processing moments. The system was also used by Atari.

Zeus (1997-1999)
Main CPU: TMS320C32 32-bit Floating Point DSP @ 60 MHz
Graphics Chip: Custom FPGA (Zeus hardware use a more advanced blitter than V-Unit games)
Sound CPU: ADSP-2104 @ 16MHz
Sound Chip: DCS-2 Sound System

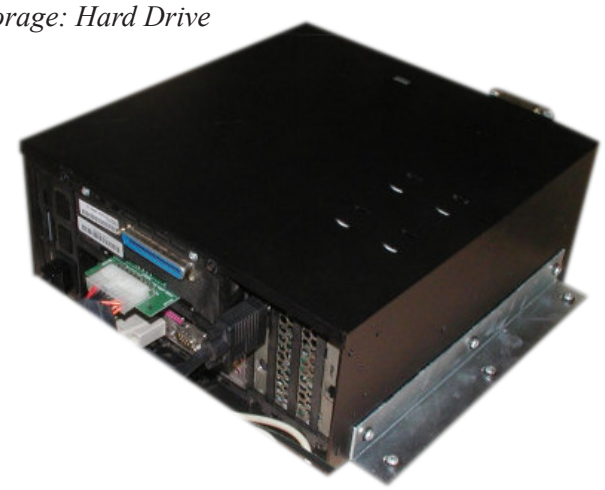
Midway Vegas (1998-2000)
Main CPU: MIPS RM7000
Graphics: 3DFX Voodoo Banshee Chipset
Sound: DCS Sound System (ADSP-2104)
Board composition: CPU board, IO board, 3Dfx Banshee video card and Hard Drive.
Hardware Features: Textured 3D, all normal 3DFX Banshee features.
This system was also used by Atari.

Zeus II (1999-2000)
Main CPU: TMS320C32 32-bit Floating Point DSP @ 60 MHz
Graphics Chip: Custom FPGA (Zeus hardware use a more advanced blitter than V-Unit games)
Sound CPU: ADSP-2104 @ 16MHz
Sound Chip: DCS-2 Sound System
The differences between ZEUS and ZEUS II is that Zeus II games work at higher resolution (512x400) than games running on standard Zeus Hardware (400x256)

Quicksilver II (1999-2000)
Main CPU: Intel Celeron 333/366MHz
Motherboard: Intel SE44BX-2
RAM: 64MB
Graphics Chips: Quantum Obsidian 3DFX
Storage: Hard Drive

Atlantis (2000)
Main CPU: NEC VR4310 (D30210GD-167) @ 167MHz
Sound Chip: Analog Devices ADSP-2181 (KS-133)
System Controller: NEC VRC4373 (UPD65907GL-012-NMU Rev1.0)
IDE Controller: CMD 646U2-402 (KAG2)
HPI to PCI Interface: PLX PCI9050 (F99420353)
ACE Serial Controller: Texas Instruments TL16C552A
System PLD: Altera Flex EPF6016 (EPF6016TC144-2)

Graphite (2001-2002)
Main CPU: Intel Pentium III 733MHz
RAM: 128MB
Graphics Chips: Quantum 3DFX Voodoo 3
Operating System: Windows 2000 Pro Embedded 1-2 CPU
Storage: Hard Drive



The Quantum3D Graphite arcade system was created by Quantum3D to succeed their Quicksilver and Quicksilver II boards. Like the Quicksilver II, the Graphite board has single side access to have all ports and drives accessible on a single side and is also based on standard PC hardware. The Graphite board is able to run Microsoft's Windows 98 or Windows 2000 Professional as an operating system. The hardware features a 320W power supply with external access for arcade cabinet peripherals and a steel chassis with mounting provisions for tower or shelf integration.

Mitchell

Mitchell System (1988-1991)

Namco

Namco Galaxian (1979-1982)
Main CPU microprocessor: Zilog Z80 @ 3.072 MHz (8-bit & 16-bit instructions @ 450,000 instructions per second)
Sound chips:
Namco custom sound hardware
Audio channels: One programmable 4/8-bit waveform channel, three 4-bit square wave channels, two 17-bit noise channels, one modulated noise pulse channel
Graphics chipset: Namco custom video hardware
Display resolution: 256x224 to 384x264 (horizontal), 224x256 to 264x384 (vertical)
Refresh rate: 60.60606 Hz (V-sync)
Color model:
RGB
Color palette: 224
Colors on screen: 32
Background planes:
Tilemap plane: 8x8 tile sizes, vertical scrolling
Bitmap plane: Star generator, vertical scrolling
Sprite capabilities: Line buffer, 8x8 to 16x16 sizes, 4 colors per sprite, 15 sprites (7 main sprites, 7 shells, 1 missile) per scanline, 240 sprite pixels per scanline, sprite flipping, sprite animation
The Namco Galaxian was an 8-bit arcade game system board, which was first used by Namco for Galaxian in 1979; it was the first board from the company to use the Zilog Z80 microprocessor (as opposed to the older Intel 8080). It used specialized graphics hardware supporting RGB color, multi-colored sprites and tilemap backgrounds. Its introduction of colorful tilemap graphics distinguished it from the Taito 8080 monochrome framebuffer system of Space Invaders. Namco Galaxian also introduced a sprite line buffer system, which was adopted by later systems such as the Namco Pac-Man, Midway's Tron hardware and Sega Z80.

Namco Pac-Man (1980-1983)
Main CPU: Z80
Sound Chip: Custom 3 channel 4-bit WSG
Video resoution: 256x224
The Namco Pac-Man was an 8-bit arcade game system board that was first used by Namco in 1980; the second and third games to run on it, Rally-X and New Rally-X, were modified to support a larger color palette and scrolling. Three unauthorized Pac-Man sequels were later developed by Bally Midway, Namco's old US distributor, on this board between 1981 and 1983 - and after Namco ended its partnership with Bally Midway after the release of Pac-Land in 1984, it developed Jump Shot (a basketball simulation) and Shoot the Bull (a darts game) on it, in the following year.

Namco Galaga (1981-1984)
Main CPU: Z80
Sound CPU: Z80
Sound Chip: Use the same custom 3 channel WSG (waveform sound generator) as Pac-Man.
Graphics CPU : Z80
Other Chips: Custom I/O controller (type 1) which handles the controls. Bosconian also has a second I/O controller (type 1) which handles the speech
Video resoution: 288x224

The Namco Galaga is an 8-bit arcade game system board which was first used by Namco in 1981. the fourth and fifth titles to use it, Xevious and its 1984 update Super Xevious, were also modified to support a 129-color palette. Each game uses a different video board (Xevious and Super Xevious are of course the same).

Namco Pole Position (1982-1983)
Main CPU: Z80
Secondary CPUs: 2 x Z8002
Sound CPU: Uses one of the secondarys CPU's for the sound as well
Other Chips: Two custom I/O controllers (type 1) handles the controls and the speech.
Video resoution: 256x224
The Namco Pole Position was an arcade system board, which was first used by Namco in 1982 for the Pole Position arcade games; it was one of the first system boards to utilize stereo and quadraphonic sound, and used NVRAM to save its high scores after a machine was turned off. It was also the first arcade system to use 16-bit microprocessors, with two Zilog Z8002 processors. It was the most powerful and expensive arcade system upon release, costing $4200. The hardware is capable of pseudo-3D, sprite-scaling.

Namco Super Pac-Man (1982-1985)
Main CPU: M6809
Sound CPU: M6809
Sound Chip: Namco custom 8 channel 4-bit WSG.
Other Chips: Custom I/O controller (type 2) which handles the controls.
Video resoution: 288x224
The Namco Super Pac-Man is an 8-bit arcade system board that was initially used by Namco in 1982; it was the first board from the company that used a Motorola M6809 processor (in fact, it used two) instead of a Zilog Z80.

Namco Phozon (1983-1984)
Main CPU: 2x Motorola M6809, 1.536 MHz[1]
Sound CPU: Motorola M6809, 1.536 MHz
Sound chip: Custom 8-channel WSG (Waveform Sound Generator)
Video resolution: 224 x 288
The Namco Phozon, also known as the Namco Gaplus, was an 8-bit arcade game system board which was first used by Namco in 1983; the first game to run on it (and the one after which it is named) was only released in Japan while the second (and last) game to run on it was a sequel to Galaga (after which it got its alternate name), released in the United States by Bally Midway as Galaga 3 to increase recognition among fans of its two predecessors and boost its sales.

Namco Libble Rabble (1983-1986)
Main CPU: M6809
Secondary CPUs: 68000
Sound CPU: M6809
Sound Chip: Namco custom 8 channel WSG
Other Chips: Custom I/O controller (type 2)
Video resoution: 288x224
The Namco Libble Rabble, also known as the Namco System 16 Universal, is an 8-bit arcade system board which was first used by Namco in 1983. Its alternative name predates the Sega System 16 16-bit system board by two years, and it was the first system board from Namco to use a Motorola 68000 microprocessor (running at 6.144 MHz), which would make it the company's most powerful 8-bit arcade system board, until the advent of the Namco Thunder Ceptor system board in 1986.

Namco Pac-Land (1984-1985)
Main CPU: M6809
Sound/Controls CPU: HD63701
Sound Chip: Custom 8 channel programmable 4-bit WSG
Video resoution: 288x224
The Namco Pac-Land was an 8-bit arcade game system board which was first used by Namco in 1984; the second and fifth games to run on it, Dragon Buster and Sky Kid, are modified to support vertical scrolling, and the third and fourth games to run on it, Metro-Cross and Baraduke (also known as Alien Sector), are modified to support a 2048-color palette. Baraduke was also the only game from Namco to use their programmable sound generators for speech.

Namco System 86 (1986-1987)
Main CPU: 6809
Sub CPU: 6809
MCU + Sound CPU: HD63705
Sound chips: YM2151 + Namco custom 8 channel programmable 4-bit WSG.
Video resoution: 288x224
Board composition: Single Board
The Namco System 86 is an 8-bit arcade system board which was first used by Namco in 1986; it was the first board from that company to use a Yamaha YM2151 FM sound chip, and was succeeded by the more powerful Namco System 1 (originally called Namco System 87) arcade system board when the company went 16-bit in 1987.

Namco System 1 (1987-1991)
Main CPU: M6809
Sub/Graphics CPU: M6809
Sound CPU: M6809
MCU: HD63701 (Controls and DAC sound)
Sound chips: Namco custom 8 channel 4-bit PSG for sound effects, Yamaha YM3012 2 channel 8-bit DAC for voice, Yamaha YM2151+YM3012 FM chip for music.
Video resoution: 288x244 pixels (36x28 tiles),
3 scrolling 64x64 tilemapped playfields,
1 scrolling 64x32 tilemapped playfield,
2 fixed 36x28 tilemapped playfields.
Colours: 3 24-bit programmable RGB palette tables, 8 bits per color as follows:
127 16-color entries for the sprites,
8 256-color entries for the playfields,
8 256-color entries for the playfields shadow/highlight effects.
The Namco System 1 (originally known as the Namco System 87, according to the Namco Museum series), is a 8-bit arcade system board which was first used by Namco in April 1987 and was a major enhancement to the previous Namco System 86 arcade system board; nonetheless, it was less powerful than the 8-bit Namco Thunder Ceptor board.

Yokai Dochuki was the first game to use this board; the game's name translated to English as "Supernatural Creature Traveller's Journal". Two months later, Namco released Dragon Spirit, which was one of the most difficult vertical scrolling shooters ever seen for its time period - and this was followed by the Japan-exclusive Blazer in July, using isometric perspective, Quester in September, which was also Japan-exclusive and represented the company response to Taito Corporation's Arkanoid, Pac-Mania in November, and Galaga '88 in December, which was the fourth title in the Galaxian series. Towards the end of the year, it was joined by the more powerful Motorola 68000-based Namco System 2 system board; the following March, Namco released World Stadium, which was the first in a long line of Japan-exclusive baseball games. This was followed by Chōzetsurinjin Beraboh Man in May, which was later re-released as Bravoman upon the TurboGrafx-16, Märchen Maze in July, which was loosely based on Alice's Adventures in Wonderland, Bakutotsu Kijūtei in August, which was a sequel to Baraduke, World Court in October, Splatterhouse in November, which was their first game to get a parental advisory disclaimer and Face Off in December - and, when it came to 1989, they released Rompers in February, Blast Off in March, which was their sequel to Bosconian, World Stadium '89 in July, and Dangerous Seed in December. In 1990, they released World Stadium '90 in July, Pistol Daimyo no Bōken in October, which is the spin-off from Beraboh Man

and Souko Ban Deluxe in November; they also develop an unreleased prototype, Puzzle Club. Finally, in 1991, they released Tank Force - which was the sequel to (and is eleven years younger than) Tank Battalion.

On system 1 boards there is a 3 pin connector which according to the schematics for Pacmania is a "3D grass driver", system16.com assume this actually means 3D glasses, that were never used.

Namco System 2 (1987-1993)
CPU: 2 x 68000 @ 12.288 MHz
Sound CPU: M6809 @ 3.072 MHz
MCU: HD63705 @ 2.048 MHz
Extra MCU: Namco C68 (not present in all games)
Sound Chips: Yamaha YM2151 @ 3.57958 MHz FM + C140 24 channel stereo PCM sample player
The 4 CPU's are all connected via a central 2KByte dual port SRAM. The two 68000s are on one side and the 6809/63705 are on the other side. Each 68000 has its own private bus area AND a common shared area between the two devices, which is where the video ram/dual port/Sprite Generation etc.
Standard Graphics Board (there are game specific variations):
2 x Static tile planes (36x28 tiles)
4 x Scolling tile planes (64x64 tiles)
1 x Rotate/Zoom tile plane (256x256 tiles)
128 Sprites (128 Sprites displayable, but 16 banks of 128 sprites)
Video resoution: 288x224
Colours: The system has 8192 pens of which 4096+2048 are displayable at any given time. These pens reference a 24 bit colour lookup table (R8:G8:B8)
2 x Static tile planes (36x28 tiles)
4 x Scolling tile planes (64x64 tiles)
Board composition: Graphics Board and CPU board
The Namco System 2 is a 16-bit arcade system board that was first used by Namco in December 1987, and a major enhancement for their earlier Namco System 1 arcade system board (which was introduced in April of that same year); it was later succeeded by the 3D Namco System 21 "Polygonizer" arcade system board, in 1988.

The Namco System 2 board is a 5 CPU system. The complete system consists of two boards : CPU + GRAPHICS. The system is extremely powerful and flexible. A standard CPU board is coupled with a number of different graphics boards to produce a system.

There are at least 3 more known variants of graphics board that all have their own unique capabilities and separate memory map definition

Final Lap was the first game to use this board, and also the first to allow up to eight players to play simultaneously, when four two-player cabinets were linked together; the following year, six more games using this board were released, which were Assault, Assault Plus, Ordyne, Metal Hawk, Mirai Ninja and Phelios. In 1989, they released Valkyrie no Densetsu (the sequel to Valkyrie no Bōken: Toki no Kagi Densetsu), Dirt Fox, Finest Hour, Burning Force, Four Trax, and Marvel Land - and, in 1990, they released Kyūkai Dōchūki, Final Lap 2, Dragon Saber, electromechanical Golly! Ghost!, Rolling Thunder 2, and Steel Gunner. For 1991, they released Super World Stadium, Steel Gunner 2, and Cosmo Gang the Video (which featured characters from a "redemption" machine); in 1992, they released Bubble Trouble: Golly! Ghost! 2, Suzuka 8 Hours, Super World Stadium '92 (and its Gekitōban variant), Final Lap 3 and Lucky & Wild. Then, in 1993, they released Super World Stadium '93 Gekitōhen and Suzuka 8 Hours 2, and the board was retired after six years.

Namco System 21 (1988-1993)
Board 1:
DSP Board - 1st PCB. (Uppermost)
DSP Type 1: 4 x TMS320C25 connected x 4 x Namco Custom chip 67 (68 pin PLCC) (Cybersled)
DSP Type 2: 5 x TMS320C20 (Starblade)
OSC: 40.000MHz
RAM: HM62832 x 2, M5M5189 x 4, ISSI IS61C68 x 16
ROMS: TMS27C040
Custom Chips:
4 x Namco Custom 327 (24 pin NDIP), each one located next to a chip 67.
4 x Namco Custom chip 342 (160 pin PQFP), there are 3 leds (red/green/yellow) connected to each 342 chip. (12 leds total)
2 x Namco Custom 197 (28 pin NDIP)
Namco Custom chip 317 IDC (180 pin PQFP)
Namco Custom chip 195 (160 pin PQFP)
Board 2:
Unknown Board - 2nd PCB (no roms)
OSC: 20.000MHz
RAM: HM62256 x 10, 84256 x 4, CY7C128 x 5, M5M5178 x 4
Other Chips:
MB8422-90LP
L7A0565 316 (111) x 1 (100 PIN PQFP)
150 (64 PIN PQFP)
167 (128 PIN PQFP)
L7A0564 x 2 (100 PIN PQFP)
157 x 16 (24 PIN NDIP)
Board 3:
CPU Board - 3rd PCB (looks very similar to Namco System 2 CPU PCB)
CPU: MC68000P12 x 2 @ 12 MHz (16-bit)
Sound CPU: MC68B09EP (3 MHz)
Sound Chips: C140 24-channel PCM (Sound Effects), YM2151 (Music), YM3012 (?)
XTAL: 3.579545 MHz
OSC: 49.152 MHz
RAM: MB8464 x 2, MCM2018 x 2, HM65256 x 4, HM62256 x 2
Other Chips:
Sharp PC900 - Opto-isolator
Sharp PC910 - Opto-isolator
HN58C65P (EEPROM)
MB3771
MB87077-SK x 2 (24 pin NDIP, located in sound section)
LB1760 (16 pin DIP, located next to SYS87B-2B)
CY7C132 (48 PIN DIP)
Namco Custom:
148 x 2 (64 pin PQFP)
C68 (64 pin PQFP)
139 (64 pin PQFP)
137 (28 pin NDIP)
149 (28 pin NDIP, near C68)
Board 4:
4th PCB (bottom-most)
OSC: 38.76922 MHz
There is a 6 wire plug joining this PCB with the CPU PCB. It appears to be video cable (RGB, Sync etc..)
Jumpers:
JP7 INTERLACE = SHORTED (Other setting is NON-INTERLACE)
JP8 68000 = SHORTED (Other setting is 68020)
Namco Custom Chips:
C355 (160 pin PQFP)
187 (120 pin PQFP)
138 (64 pin PQFP)
165 (28 pin NDIP)MCU : HD63705 (2 MHz)
The Namco System 21 "Polygonizer" is an arcade system board unveiled by Namco in 1988 with the game Winning Run. It was the first arcade board specifically designed for 3D polygon processing. The hardware went through significant evolution throughout its lifespan until the last game, Cyber Sled, was released in 1993.

It was in development for over three years before release, since around the mid-1980s. According to Phil Harrison (in the September 1989 issue of Commodore User), who visited Namco's Tokyo office, Atari's Hard Drivin' ran on an earlier, less powerful, version of this hardware, stating that Namco

and Atari Games were sister companies at the time and that the System 21 was a shared development.

This system comprises 4 PCB's that slot into a backplane, which are housed in a metal crate. At the moment it seems like there are 3 revisions of the hardware, Winning Run was a mass produced prototype for the System, the early games used 5 x TMS320C20 and later moved to 4 x TMS320C25. The board uses the Namco NB1 sprite system for the 2D graphics.

Namco NA-1 (1992-1995)
Main CPU: 68000 @ 12.5 MHz
Sound CPU: C69 (Mitsubishi M37702 with internal bios)
Sound chip: C140 (integrated into the "219" custom)
Video resoution: 304x224
Board composition: Main board and Rom board
The Namco NA-1 is a 16-bit arcade system board which was first used by Namco in July 1992, and was the successor to the Namco System 1 and 2 system board; the company's first quiz game, Bakuretsu Quiz Ma-Q Dai Bōken, was the first game to use it. Three months later, they released F/A (which was later renamed, to Fighter & Attacker, for the United States) - and this was followed by Cosmo Gang the Puzzle in November (which became an inspiration for Pac-Attack) Exvania in December (which is one of only two Japan-exclusive games from them with an FBI "Winners Don't Use Drugs" screen) and Super World Court in December (a sequel to Pro Tennis: World Court, which had five Pac-Mans playing the part of ball boys on its "Namco" court, and the players could send the two on the sides flying through the air!). The following year, they released Emeraldia and Tinkle Pit; the Namco NA-2 is also backwards compatible with the NA-1. It is not yet known what extra features the NA-2 has apart from different MCU code - and the first game to run on it was Knuckle Heads, released in its initial year. The following year, they released an NA-2 version of Emeraldia, Net-tō! Geki-tō! Quiz-tō!!, and Numan Athletics; two years after that they released Ren'ai Jumyō + Nikutai Jumyō X-Day 2 (the sequel to Yomei Kensaku Sābisu X-Day, so this means that they did not release any games on either the NA-1 or NA-2 arcade system boards in 1994, which is an unusual occurrence).

Namco NB-1 (1993-1997)
CPU: Motorola 68EC020 32-bit @ 24.192 MHz
Sound CPU: Namco C75 (M37702 based 16-bit) @ 16.128 MHz
Sound chip: Namco C352 32 channel 42KHz stereo supported 8-bit linear and 8-bit muLaw PCM - 4 channel output
Secondary CPU's: C329 + C137
Custom Graphics Chips: GFX:123,145,156,C116 - Motion Objects: C355,187,C347
Sound CPU: C351
Control Chip: C160
Board composition: Additional "gun" interface board is used on shooting games (seen on 2nd PCB picture)
The Namco NB-1 is a 32-bit arcade system board which was first used by Namco in 1993; NB-2 has a different memory map, more complex sprite and tile banking, and two additional ROZ layers over the NB-1. Great Sluggers: New World Stadium was the first game to use this board - and the following year, Nebulas Ray, Great Sluggers '94, J-League Soccer V-Shoot, Point Blank/Gun Bullet, The Outfoxies and Mach Breakers: Numan Athletics 2 were released on it. In 1995, the eighth title for Namco's long-running World Stadium series was released, Super World Stadium '95 (which borrowed heavily from that original Great Sluggers); in the two following years, it was followed up by Super World Stadium '96 and Super World Stadium '97, the second of which was the last game to use it.

Namco System FL (1993-1995)
CPU: Intel i960-KB 32-bit RISC @ 20 MHz
Sound CPU: Namco C75 (M37702 based 16-bit) @ 16.384 MHz
Sound Chip: Namco C352 32 channel 42KHz stereo supported 8-bit linear and 8-bit muLaw PCM - 4 channel output
Board composition: Single Board
The Namco System FL is an arcade system board released by Namco in 1993. «FL» probably refers to the initials of the game Final Lap R. This system was exclusively designed for driving games, it had a very short lifespan and was released only two games on it. Games produced on this arcade board are conventional driving simulations. Final Lap R was the last installment in the Pole Position arcade series.

Namco System 22 (1993–1995)
CPU: Motorola 68EC020 32-bit @ 24.576 MHz
Sound CPUs: 2 x Namco C74 (M37702 based 16-bit) @ 16.384 MHz
3D DSPs: 2 x Texas Instruments TMS320C25 16-bit fixed point DSP @ 49.152 MHz
Sound chip: Namco C352 32 channel 42KHz stereo supported 8-bit linear and 8-bit muLaw PCM - 4 channel output
Colours: 16.7 million colours onscreen
Features: Texture mapping, Gouraud shading, Translucency effects, Depth-cueing, Up to 240000 polygons/sec.
Board composition: Crate containing many PCB's
The Namco System 22 is the successor to the Namco System 21 arcade system board. It debuted in 1992 with Sim Drive in Japan, followed by a worldwide debut in 1993 with Ridge Racer.

The System 22 was designed by Namco with assistance from graphics & simulation company Evans & Sutherland. Graphical features include texture mapping, Gouraud shading, transparency effects, and depth cueing, thanks to the Evans & Sutherland 'TR3' chip/chipset, which stands for: Texture Mapping, Real-Time, Real-Visual, Rendering System. The main CPU provides a scene description to the TR3 graphics processing unit and a bank of DSP chips which perform 3D calculations.

A variant of the system, called the Super System 22, was released in 1995. The hardware was largely similar to the System 22, but with a slightly higher polygon rate and more special effects possible. Both Super System 22 and System 22 can render significantly better graphics, more polygons with sharper texture-mapping, running in higher resolution and at a higher framerate compared to the graphics capabilities of the original Sony PlayStation, the Sega Saturn and the Nintendo 64 video game systems, but much less than what the Sega Dreamcast can produce.

According to Namco America the twin seat Ridge Racer arcade unit sold to distribution for $11,995.00 in 1993.
The hardware:
- coprocessor and BIOS to handle sound and inputs
- a character layer: 64x64 8x8 256 color pixel tiles
- polygons, which are rendered by the DSP coprocessors

The main CPU describes a set of objects in 3d space by writing a scene description to shared memory. This includes:
- a list of opcodes, transformations, and object parameters
- attributes for up to 8 windows

Each window defines:
- projection paramaters
- clipping information
- optional camera viewing transforms
- priority
- light source data

The graphics coprocessors take as input:
- the scene description from the main CPU
- a table of 3d objects encoded in "Point ROMs"
- a single giant 256 color tilemap encoded in texture ROMs, that the object models reference

- parameters for depth cueing (fog effects)

The coprocessors render the scene and acknowledge when they are done. The actual number and arrangement of DSPs can change from game to game, but from the main CPU's point of view it's talking to a single slave using a consistant API. Aside from the status bits and self tests, communication is strictly one-way. The slave CPU doesn't report collision detection, for example. The polygon layer consists of a large number of quads, and the texture source is a single huge tilemap, with 8 pens per pixel. The part of the master palette that is used is specified per quad. There's also a set of 2d sprites, which can be zoomed but don't rotate. They have a z coordinate that interacts with the zbuffer to decide whether they appear in front or behind polygon pixels. Finally, there's a single tilemap that has priority over everything.

Namco System 11 (1994–1999)
Main CPU: R3000A 32 bit RISC processor, Clock - 33.8688MHz, Operating performance - 30 MIPS, Instruction Cache - 4KB
BUS: 132 MB/sec.
OS ROM: 512 Kilobytes
Sound CPU: Namco C76 (Mitsubishi M37702)
Sound chip: Namco C352
Main RAM: 2 Megabytes
Video RAM: 2 Megabyte
Sound RAM: 512 Kilobytes
Graphical Processor: 360,000 polygons/sec, Sprite/BG drawing, Adjustable frame buffer, No line restriction, 4,000 8x8 pixel sprites with individual scaling and rotation, Simultaneous backgrounds (Parallax scrolling)
Sprite Effects: Rotation, Scaling up/down, Warping, Transparency, Fading, Priority, Vertical and horizontal line scroll
Resolution: 256x224 - 740x480
Colours: 16.7 million colors, Unlimited CLUTs (Color Look-Up Tables)
Other Features: custom geometry engine, custom polygon engine, MJPEG decoder
All roms are surface mounted Intel flash roms, with all the roms on the mainboard apart from the graphics roms which are on a seperate rom board.
The boards are therefore unique to each game and you cannot swap roms from one to another.
The Namco System 11 is an arcade system board released by Namco in 1994. The actual hardware is based on Sony's PlayStation home console, and thus many games were ported to that console. The major difference between the two is that the System 11 used surface-mounted ROM chips to store the game data, whereas the PlayStation used CD-ROM. This meant that all System 11 games were unique to the particular system board, and could not be swapped out with another game.

Although the System 11 was technically inferior to Sega's Model 2 arcade board, its lower price made it an attractive prospect for smaller arcades.

According to the June 1995 issue of Edge:
"Namco took a significant risk in basing its Tekken coin-op on raw PlayStation hardware, considering that it would be competing directly with Sega's Model 2-powered Virtua Fighter 2 ... For once, a home system can boast an identical conversion of a cutting-edge coin-op ... Namco's research section managing director, Shegeichi Nakamura ... explains: "When Sony came along we decided to go for a low-cost system—in short, we've left the big arcade stores to Sega and VF2 and Tekken has been sold to smaller arcade centres" ... Namco has a further four titles planned for System 11, all of which are likely to make the jump to the PlayStation".

Namco System Super 22 (1995–1997)
CPU: Motorola 68EC020 32-bit @ 24.576 MHz
Sound CPU: Mitsubishi M37710 16-bit @ 16.384 MHz
3D DSPs: 2xTexas Instruments TMS320C25 16-bit fixed point DSP @ 49.152 MHz
Sound chip: Namco C352 32 channel 42KHz stereo supported 8-bit linear and 8-bit muLaw PCM - 4 channel output
Additional Chips: Insanely large amount of Namco custom chips.
Colours: 16.7 million colours onscreen
Features: Texture mapping, Gouraud shading, Translucency effects, Depth-cueing, More than 240000 polygons/sec.
Board composition: Crate containing many PCB's
The Namco System Super 22 is very similar to System 22 hardware, but with some noticable differences, slightly higher poly rate and more special effects. It is possible that the 2D part supports rotating as well, also the crate is physically smaller.

Namco ND-1 (1995-1996)
Main processor: MC68000 12MHz
Sub-processor: HD6413002F16 16MHz (Hitachi H8 microcontroller), C416 custom
Other Chipset: MACH210-15 (Programmable logic device)
Sound processor: C352 Custom IC
GFX: YAMAHA YGV608-F
Video out: LM1203N
Board composition: Single Board - Surface mounted roms
The Namco ND-1 16-bit system board was first used by Namco in 1995.

Namco System 12 (1997–2001)
Main CPU: R3000A 32 bit RISC processor, Clock-48MHz, Operating performance - 30 MIPS, Instruction Cache - 4 KB
BUS: 132 MB/sec.
OS ROM: 512 Kilobytes
Sound CPU: Hitachi H8 3002
Additional Sound Chip: Namco C352 sample playback
Main RAM: 2 Megabytes
Video RAM: 2 Megabyte
Sound RAM: 512 Kilobytes
Graphical Processor: 360,000 polygons/sec, Sprite/BG drawing, Adjustable frame buffer, No line restriction, 4,000 8x8 pixel sprites with individual scaling and rotation, Simultaneous backgrounds (Parallax scrolling)
Sprite Effects: Rotation, Scaling up/down, Warping, Transparency, Fading, Priority, Vertical and horizontal line scroll
Resolution: 256x224 - 740x480
Colours: 16.7 million colors, Unlimited CLUTs (Color Look-Up Tables)
Other Features: custom geometry engine, custom polygon engine, MJPEG decoder

The Namco System 12 is an arcade system board released by Namco in late 1996. In hardware, it is an upgrade from Sony's PlayStation-based System 11, the MIPS R3000A microprocessor is 50% faster, and the C76 sound processor is replaced by the H8/3002. Like the System 11, the System 12 used surface-mounted ROM chips, meaning the boards were unique to each game.

Namco Gorgon/System 22.5 (1997)
CPU: R4650 (MIPS III with IDT special instructions) 64-bit main CPU @ 133 MHz
Sound CPU: H8/3002 16-Bit @ 16.384 MHz
Sound Chip: Namco C352 32 channel 42KHz stereo supported 8-bit linear and 8-bit muLaw PCM - 4 channel output
Graphics Hardware: Namco Custom Texture Mapped Polygons Hardware, 1 text tilemap
I/O: I/O board based on the Namco C78, which is a Renesas H8/3334 MCU (8-bit version of the H8/3002), the I/O boards' MCUs are connected to the H8/3002's serial port.

Namco System 23 (1997–1999)
CPU: R4650 (MIPS III with IDT special instructions) 64-bit main CPU @ 166 MHz
Sound CPU: H8/3002 16-Bit @ 16.384 MHz
Sound Chip: Namco C352 32 channel 42KHz stereo supported 8-bit linear and 8-bit muLaw PCM - 4 channel

output
Graphics Hardware: Namco Custom Texture Mapped Polygons Hardware, 1 text tilemap
Colours: 16.7 million colours onscreen
Features: Texture mapping; Gouraud shading; Depth-cueing
I/O: I/O board based on the Namco C78, which is a Renesas H8/3334 MCU (8-bit version of the H8/3002), the I/O boards' MCUs are connected to the H8/3002's serial port.
Board composition: Crate of PCB's

The Namco System 23 is an arcade system board produced and developed by Namco. Announced in 1996 and released in 1997, it was the last arcade system produced by the company that was based on their own custom design, as opposed to just a derivative of console hardware. Like the System 22, the System 23 also featured a more powerful variant called the Super System 23. One of the advertised features of the System 23 was the "Gashin Strong Bass System," which was simply a bass amplifier hooked up to the sound system. It was succeeded by the Namco System 10 in 2000.

Namco System Super 23 (1998–1999)
CPU: R4650 (MIPS III with IDT special instructions) 64-bit main CPU @ 166 MHz
Sound CPU: H8/3002 16-Bit @ 16.384 MHz
Sound Chip: Namco C352 32 channel 42KHz stereo supported 8-bit linear and 8-bit muLaw PCM - 4 channel output
Graphics Hardware: Namco Custom Texture Mapped Polygons Hardware, 1 text tilemap
Colours: 16.7 million colours onscreen
Features: Texture mapping; Gouraud shading; Depth-cueing
Extra Hardware features: System Super 23 games have texture filtering that standard System 23 games don't have.
I/O: Uses a PIC16Cxx-based I/O board. The I/O boards' MCUs are connected to the H8/3002's serial port.
Board composition : Crate of PCB's

The Namco System Super 23, like the System 22, is a more powerful variant of System 23.

Namco System Super 23 GMEN (1998–1999)
Two games were released for the system; Final Furlong 2 (1999) and Gunmen Wars (1998).

Namco System Super 23 Evolution 2 (1999)
Only game released for the Super 23 Evolution 2 was Crisis Zone.

Namco System 10 (2000–2006)
Main CPU: R3000A 32 bit RISC processor, Operating performance - 30 MIPS, Instruction Cache - 4KB
OSC: 53.693175MHz and 101.4912MHz
BUS: 132 MB/sec.
OS ROM: 512 Kilobytes
Additional Sound Chips: Playstation SPU, 24 Channels, 44.1KHz sample rate, PCM audio source, Digital effects include: Envelope, Looping, Digital Reverb, Load up to 512K of sampled waveforms, Supports MIDI Instruments.
Main RAM: 2 Megabytes
Video RAM: 2 Megabyte
Sound RAM: 512 Kilobytes
Graphical Processor: 360,000 polygons/sec, Sprite/BG drawing, Adjustable frame buffer, No line restriction, 4,000 8x8 pixel sprites with individual scaling and rotation, Simultaneous backgrounds (Parallax scrolling)
Sprite Effects: Rotation, Scaling up/down, Warping, Transparency, Fading, Priority, Vertical and horizontal line scroll
Resolution: 256x224 - 740x480
Colours: 16.7 million colors, Unlimited CLUTs (Color Look-Up Tables)
Other Features: custom geometry engine, custom polygon engine, MJPEG decoder
Roms: Roms and some CD/DVD Based (Drum Master)

The Namco System 10 is an arcade system board released by Namco in 2000 based on the Sony PlayStation hardware. It was preceded by the Namco System 23 in 1997 and succeeded by the Namco System 246.

Namco System 246 (2000–2008)
CPU:
128 Bit "Emotion Engine"
System Clock: 300 MHz
System Memory: 32 MB Direct Rambus
Memory Bus Bandwidth: 3.2 GB per second
Co-Processor: FPU (Floating Point Multiply Accumulator x 1, Floating Point Divider x 1)
Vector Units: VU0 and VU1 (Floating Point Multiply Accumulator x 9, Floating Point Divider x 1)
Floating Point Performance: 6.2 GFLOPS
3D CG Geometric Transformation: 66 million Polygons Per Second
Compressed Image Decoder: MPEG2
Graphics:
"Graphics Synthesizer"
Clock Frequency: 150MHz
DRAM Bus bandwidth: 48 GB Per Second
DRAM Bus width: 256 bits
Pixel Configuration: RGB:Alpha:Z Buffer (24:8:32)
Maximum Polygon Rate: 75 Million Polygons Per Second
Sound:
"SPU2+CPU"
Number of voices: ADPCM: 48 channel on SPU2 plus definable by software
Sampling Frequency: 44.1 KHz or 48 KHz (selectable)
I/O Processor
CPU Core: Current PlayStation CPU
Clock Frequency: 33.8 MHz or 37.5 MHz (selectable)
Sub Bus: 32 Bit

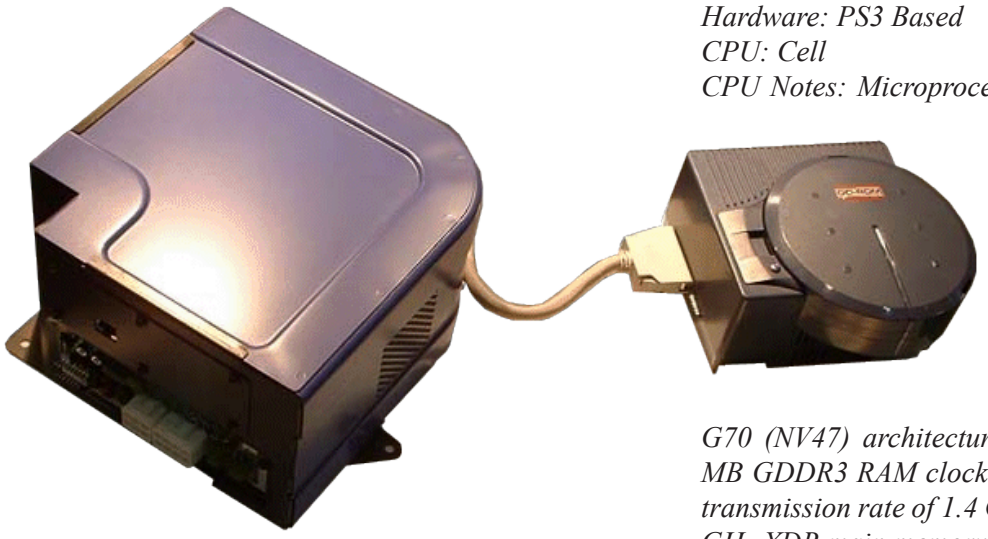
The Namco System 246 is a development of the Sony PlayStation 2 technology as a basis for an arcade system board. It was released in 2001 on its first game Ridge Racer V. Like the Sega NAOMI, it is widely licensed for use by other manufacturers. Games such as Battle Gear 3 and Capcom Fighting Evolution are examples of System 246-based arcade games that are not Namco products.

Namco System 256 (2004–2010)
Namco System 256 is an upgraded version of 246 but the upgrades are unknown (more RAM and faster CPU speeds likely). This isnt the first time Namco (and several other companies) have done this, System 12 was an "enhanced" version of the standard System 11 PSX based hardware.

Triforce (2005–2007)
CPU: IBM Power PC "Gekko"
Sound DSP: Custom Macronix 16bit DSP @ 81MHz
Main RAM: Main Memory 48 MB MoSys 1T-SRAM, Ap-

proximately 10ns Sustainable Latency.
RAM: Version "A" upgradable RAM modules, up to 512MB (possibly higher)
RAM: Version "B" unknown
Graphics Engine: "Flipper" (Custom ATI/Nintendo)
Color: 24-bit Color, 24-bit Z Buffer.
Hardware Features: Fog, Subpixel Anti-aliasing, 8 Hardware lights, Alpha Blending, Virtual Texture Design, Multi-texture, Mapping/Bump/Environment Mapping, MIPMAP, Bilinear/Trilinear/Anisotropic Filtering, Real-time Texture Decompression (S3TC), HW 3-line Deflickering filter.

The Triforce is an arcade system board developed jointly by Namco, Sega, and Nintendo, with the first games appearing in 2002. The name "Triforce" is a reference to Nintendo's The Legend of Zelda series of games, and symbolized the three companies' involvement in the project. The system hardware is based on the Nintendo GameCube with several differences, like provisions for add-ons such as Sega's GD-ROM system and upgradeable RAM modules. The Triforce was initially believed to have twice as much 1T-SRAM as the Nintendo GameCube (48MB instead of 24MB), but this was disproven by a teardown analysis of a Triforce board.



A few versions of the Triforce exist. The first two are the Type-1 and Type-3 units, the former using an external DIMM board (same as used on the Naomi and Naomi 2) while the latter integrates this component inside the metal casing. A custom Namco version exists which only accepts custom NAND Flash based cartridges, which has a different Media board and supposedly different baseboard. These boards use the same metal case design as the Type-3 Triforce.

Since 2012, amateur applications have been released for the Nintendo Wii that enable this GameCube-derived console to run Mario Kart Arcade GP, Mario Kart Arcade GP 2, F-Zero AX and Virtua Striker 4 Ver.2006. Triforce can be emulated in software by Dolphin.

Namco System N2 (2005–2010)
Hardware: PC (Unknown Specification, possibly varies between games)

The Namco System N2 arcade platform runs on an nForce2-based motherboard that Nvidia developed. It is based on a GeForce graphics card, using the OpenGL API. It runs a Linux operating system that appears to be based on Debian etch. Also, according to the boot logo, System ES2 PLUS and System ES3 run Windows Embedded 7 as their operating system. It runs in an arcade game racing cabinet designed by Bandai Namco Games.

Because the N2 is based on PC architecture, development for it and porting from it is relatively easy and inexpensive.

Namco System Super 256 (2006)
The hardware is based on Sony PlayStation 2

Namco Super System 256 is the same as regular Namco System 256 but it has the gun board integrated.

Namco System 357 (2007–)
Hardware: PS3 Based
CPU: Cell
CPU Notes: Microprocessor consisting of one 3.2 GHz PowerPC-based Power Processing Element (PPE) and six Synergistic Processing Elemen ts (SPEs). PlayStation 3's Cell CPU achieves 204 GFLOPS single precision float and 15 GFLOPS double precision.
GPU: RSX
The GPU is based on NVIDIA G70 (NV47) architecture. The GPU makes use of 256 MB GDDR3 RAM clocked at 700 MHz with an effective transmission rate of 1.4 GHz and up to 224 MB of the 3.2 GHz XDR main memory via the CPU (480 MB max)
Ram: 256MB Rambus XDR DRAM, clocked at CPU die speed.
The floating point performance of the whole system (CPU + GPU) is reported to be 2 TFLOPS.

The Namco System 357 is an arcade system board based on the Sony PlayStation 3. It was released in 2007 as the board for Tekken 6. Unlike its predecessor, it has not yet seen widespread adoption by other manufacturers.

Namco System ES1 (2009–2014)
Motherboard: Supermicro C2SBM-Q (Intel Q35 + ICH-9DO Chipset)
CPU: Intel Core 2 Duo CPU E8400 at 3.00 GHz
RAM: 2×512 MB DDR2 800 MHz 1.8V
Video: Nvidia GeForce 9600 GT with 512 MB GDDR3 memory
HDD: Seagate Barracuda 7200.12 160 GB (ST316031-8AS) with copy protection
Operating System: arcadelinux (Debian 4.0 based)

The hardware is PC based and runs on a modified "Arcade Linux" operating system.

Namco System 369 (2011–2012)

System 369, also known as System 359, is an upgraded version of the System 357 arcade board. System 369 are used for Tekken Tag Tournament 2. The specifications are the same as Slim model retail PS3 consoles, and as such feature a smaller chassis with less heat.

Namco System 147 (2010–2011)
CPU:
128 Bit "Emotion Engine"
System Clock: 300 MHz
System Memory: 32 MB Direct Rambus
Memory Bus Bandwidth: 3.2 GB per second
Co-Processor: FPU (Floating Point Multiply Accumulator x 1, Floating Point Divider x 1)
Vector Units: VU0 and VU1 (Floating Point Multiply Accumulator x 9, Floating Point Divider x 1)
Floating Point Performance: 6.2 GFLOPS
3D CG Geometric Transformation: 66 million Polygons Per Second
Compressed Image Decoder: MPEG2
Graphics:
"Graphics Synthesizer"
Clock Frequency: 150MHz
DRAM Bus bandwidth: 48 GB Per Second
DRAM Bus width: 2560 bits
Pixel Configuration: RGB:Alpha:Z Buffer (24:8:32)
Maximum Polygon Rate: 75 Million Polygons Per Second
Sound:
"SPU2+CPU"
Number of voices: ADPCM: 48 channel on SPU2 plus definable by software
Sampling Frequency: 44.1 KHz or 48 KHz (selectable)
I/O Processor
CPU Core: Current PlayStation CPU
Clock Frequency: 33.8 MHz or 37.5 MHz (selectable)
Sub Bus: 32 Bit

The hardware is based on Sony PlayStation 2.

Namco System ES2 Plus (2012)

System ES2 PLUS run Windows Embedded 7 as their operating system.

Namco System ES3 (2013–)

System ES3 run Windows Embedded 7 as their operating system.

Nintendo

Nintendo Classic (1981)

VS. UniSystem and VS. DualSystem (1985-1987)
Main CPU: N2A03 (a 6502 with a few features removed)
Sound CPU: Main CPU does sound as well
Video resoution: 256x240

The Nintendo VS. System, officially sold simply as the VS. System, was a coin-operated video game platform designed for two-player competitive play using the VS. UniSystem or VS. DualSystem, arcade system boards based on the Nintendo Entertainment System. Many of these stand-up or sit-down arcade machines had two screens and controls joined at an angle. These games were ported to arcade hardware from existing home video games for the Family Computer and Nintendo Entertainment System; thus, they could be sold cheaply to arcades in the late 1980s. The hardware was introduced in 1984, and ended in 1990.

The VS. System was designed primarily as a kit to retrofit Donkey Kong, Donkey Kong Jr., Popeye, and Mario Bros. machines; as such, they require the same special monitor that these coin-ops use. These monitors use inverse voltage levels for their video signals as compared to most arcade monitors. Commercially available converters allow one to use any standard open frame monitor with the game.

Almost all the games on the VS. System run on identical hardware powered by a Ricoh 2A03 Central processing unit, the same found in the Nintendo Entertainment System but with the notable exception of special PPUs, or video chips designed for this circuit boards (RP2C04-0001, RP2C04-0002, RP2C04-0003, RP2C04-0004, RC2C03B, RC2C03C, RC2C05-01, RC2C05-03, RC2C05-04 and RP2C03B); Each chip contains a different palette that arrange the colors in different configurations chosen apparently at random. Most boards can be switched to a new game simply by swapping the program ROMs, though the appropriate PPU must also be used; if not, the game will appear with incorrect colors. Several of the later VS. games employ further measures of protection by using special PPUs which swap pairs of I/O registers and/or return special data from normally unimplemented regions of memory. Attempts to run these games in other VS. Systems will result in the game failing to even start.

Some dedicated VS. double cabinets were produced which look like two games butted together at an angle. A single motherboard powered both games on those models.

The VS. Table, a steel sit down cabinet for the VS. DualSystem, nicknamed the "red tent" due to its upper portion's resemblance to a pup tent, allow play for up to four players simultaneously. This cabinet uses the same motherboard as the double cabinet referred to above.

Due the fact that these arcades where based on the same CPU used in the Nintendo Entertainment System, they can be ported to this system by modifying the console, adding extra memory banks, DIP switches among other things.

Some games are different from their Famicom/NES versions. For example, VS. Super Mario Bros. is considerably more difficult than Super Mario Bros.; some of the levels were reused in Super Mario Bros. 2 for the Family Computer Disk System. The graphics are also different from their Famicom/NES counterparts; for example, VS. Duck Hunt has more details and animation sequences than its console counterpart.

Contrary to common belief, VS 10-Yard Fight, VS Gong Fight (Ring Fighter) and VS. Hot Smash does not belong to the VS. System since said games run in different hardware, powered by a Zilog Z80 CPU, are not PCB interchangeable and in the case of VS 10-Yard Fight and VS Gong Fight, they both lacks the point in the VS. acronym. The Same goes for VS Block Breaker which runs with a different PCB with a Hitachi SH-2 CPU. The launch titles for the hardware were Vs. Mahjong and Vs. Tennis in or about February 1984.

PlayChoice-10 (1986-1991)
Hardware : Playchoice 10
CPU : Z80 @ 4 MHz, N2A03 @ 1.789772 MHz
Sound Cpu : Custom Nintendo + DAC
Res : 256 x 240, 52 color (Both screens)

PlayChoice-10 is an arcade machine which can consist of as many as 10 different games previously available only on the Nintendo Entertainment System (NES) home console. The games for this system are in the modular form of circuit boards which are plugged into one of the ten open slots on the PlayChoice-10's motherboard.

Having found success in the home console market with the NES, Nintendo developed arcade hardware to run its most popular NES games inside an arcade cabinet. Dubbed the PlayChoice-10, the machine was compatible with the NES, but with some key differences. An extra CPU controlled the gameplay timer, game select, and displayed hints for the current game on a separate monitor (on single-monitor systems, a button would switch between gameplay and the hint screen). Most normal NES cartridges could not be used; rather, the PlayChoice used special expansion cards containing NES games along with an extra 8KB ROM to display hints. Because the PlayChoice-10 outputs RGB video using a slightly different palette, games did not look exactly the same as they did on the NES. It is in fact possible to replace the NES PPU with the PlayChoice-10 PPU, allowing it to output RGB natively.

Each machine had a different mix of games in it. Instead of a player getting to play one game until it was finished, the player got a fixed time limit to play as many PlayChoice games as they wanted to. Nintendo created several variations of the hardware, including a standalone PlayChoice unit which only had a single available game. By the late 1980s, other companies developed similar systems. Sega's Mega-Tech and Mega Play hardware was capable of running certain Sega Master System and/or Sega Mega Drive/Genesis games. SNK's Neo Geo was another cartridge-based system that was made available for both arcades and home consoles.

PlayChoice-10

Super System (1992-1993)
CPU: Ricoh 5A22 @ 3.58 MHz
Raster resolution 256 x 240 RGB (Horizontal) 52 colors
Raster resolution 256 x 240 RGB (Horizontal)
The Nintendo Super System (NSS) is an arcade system used to preview Super NES games in the United States. It is essentially the Super NES hardware with a menu interface, similar to Nintendo's PlayChoice-10 hardware for NES games, that allows players to play select Super NES games for a certain amount of time, depending on how many game credits they had.

Triforce (2002-2007)
"see Namco System Board page on Triforce"

Unnamed Wii-based arcade board (2008)
CPU:
IBM PowerPC Broadway CPU @ 729 MHz
90nm Process
32-bit Integer
64-bit Floating-Point (or 2 x 32-bit SIMD)
64KB L1 Cache (32KB Instruction + 32KB Data)
256KB L2 Cache
2.9 GFLOPS
Graphics and Sound:
ATI Hollywood @ 243 MHz
90nm Process
Napa: Graphics Processor with 3MB Embedded Memory
Vegas: Audio DSP and 24MB 1T-SRAM
Starlet: ARM9 Processor (I/O, Communication, Security)
CPU External Bus: 64 Bit, 243 MHz, 1.9 Gigabytes per Second Bandwidth
Memory: 24 Megabytes MoSys 1T-SRAM, 64 Megabytes GDDR3 DRAM
Only known game released is Tatsunoko Vs Capcom: Cross Generation of Heroes.

Psikyo

Psikyo 1st Generation (1993–1996)
CPU: 68EC020 + PIC16C57 [Optional MCU]
Sound: Z80A + YM2610 or LZ8420M (Z80 core) + YMF286-K
Custom Chips: PS2001B, PS3103, PS3204, PS3305

Psikyo SH-2 (1997–2002)
CPU: SH2 @ 28.636350 MHz
Sound CPU: YMF278B (OPL4) @ 28.636350 MHz

RCI

NEO STANDARD (2011)
CPU: Intel Core 2 Duo G6950
RAM: 2GB DDR3 1333MHz (max 8GB)
Chipset: Intel H55 Express
Video: Geforce 220: 128 bit / 1GB DDR3
HDD: 16GB SSD 2.5 "
I / O: JAMMA + JVS
The hardware is PC-based with Windows XP.

Sammy

SSV (Sammy, Seta, Visco) (1993–2001)
CPU: NEC V60 32-bit RISC @ 16MHz
Sound Chip: Ensoniq ES5506 @ 16MHz (mono output)
Colors on screen: 33024
SSV was a Joint venture between "S"ammy, "S"eta and "V"isco to produce a high-quality 32-bit RISC based hardware platform, hence the name.

Sammy Medal Game System (1999–2004)
Sammy Medal Game System is a obscure Japanese system by Sammy. It's a cartridge based platform for some cute medal games for kids.
"lucaelia.com"

Atomiswave (2003–2009)
CPU: Hitachi SH-4 32-bit RISC CPU (200 MHz 360 MIPS / 1.4 GFLOPS)
Graphic Engine: PowerVR 2 (PVR2DC)
Sound Engine: ARM7 Yamaha AICA 45 MHZ (with internal 32-bit RISC CPU, 64 channel ADPCM)
Main Ram: 32 megs
Main Memory: 16 MByte
Graphic Memory: 16 MByte
Sound Memory: 8 MByte
Media: ROM Board
Simultaneous Number of Colors: Approx. 16,770,000 (24bits)
Polygons: 2.5 Million polys/sec
Rendering Speed: 500 M pixel/sec
Additional Features: Bump Mapping, Fog, Alpha-Blending (transparency), Mip Mapping (polygon-texture auto switch), Tri-Linear Filtering, Anti-Aliasing, Environment Mapping, and Specular Effect.
Network: It is possible to connect the systems on the network using both 56K modem or broadband connection using the AW-Net.
The Atomiswave is a custom arcade system board and cabinet from Sammy Corporation. It is based on Sega's NAOMI system board (thus it's common to see the "Sega" logo on its boot up screen). The Atomiswave uses interchangeable game cartridges and the cabinet's control panel can be easily switched out with different control sets, including dual joysticks, dual lightguns and a steering wheel.

With the retirement of the aging Neo Geo MVS system, SNK Playmore chose the Atomiswave as its next system to develop games for. In a contract with Sammy, SNK Playmore agreed to develop five games for the Atomiswave system. Metal Slug 6 was SNK Playmore's fifth game for the Atomiswave, after which SNK moved on to a Taito Type X2 arcade board.

In Japan the Atomiswave was able to connect via a special modem to the AW-Net online system set up by Sammy. The AW-Net was primarily used to play online with other players and to create online player rankings. AW-Net was discontinued on 30 November 2006 following the merger of Sammy and Sega; the follow-up system was ALL.Net.

Sega

Sega G80 (1981)
Main CPU: Z80 @ 3.86712 MHz
Sound: Various combinations of;
Pure Discrete Sound
Speech Board, with i8035 + sp0250
USB Board, with i8035 and hacked up tone generation with timers and dacs for volume.
Board composition : One board
Video Resoution (Raster Hardware): 256 x 224
Video resoution (Vector Hardware): Vector
Sega G80 is an arcade system board released by Sega in 1981. The G80 was released in both raster and vector versions of the hardware.

Sega System 1 (1983–1987)
Main CPU: Z80 @ 4 MHz
Sound CPU: Z80 @ 4 MHz
Sound chip: SN76496 @ 4 MHz, SN76496 @ 2 MHz
Video resoution: 256 x 224
Board composition: One board
Hardware Features: 2 layers+sprites, hardware collision detection
Sega System 1 is a type of arcade hardware used in various Sega arcade machines from 1983 until 1987. For most of its run it coexisted with Sega System 2 (1985–1988) and as a result had many similar features. In its four-year span it was used in some 20 different arcade games, including Pitfall II: Lost Caverns, Wonder Boy, and Wonder Boy in Monster Land.

Sega System 2 (1985–1988)
Main CPU: Z80 @ 4 MHz
Sound CPU: Z80 @ 4 MHz
Sound chip: SN76496 @ 2 MHz, SN76496 @ 4 MHz
Video resoution: 256 x 224
Board composition: Main board & rom board.
Hardware Features: 2 layers+sprites, hardware collision detection
System 2 is an updated version of the System 1. The Sega System 2 had many similar features to System 1. The only major difference being that System 2 had two separate circuit boards instead of one.

Sega System E (1985–1988)
CPU: Z-80B @ 8MHz
ROM: 32K for code + up to 4 x 32/64K for banks
RAM: 16K
Video RAM: 64K (2 banks of 16K for each VDP)
VDP: 2 x 315-5124 (Same as the SMS except the are 2. Note that the 315-5124 is a TMS9928 VDP combined with a SN76489 sound chip!)
Colors: 64 (32 for each VDP. Each VDP picks its pallete from a possible 64 colors)
Resolution: 256 x 192
Screen Scroll: X, Y, partial
Audio: 6 tone channels and 2 noise channels
Characters: 8 x 8 (448 definitions per VDP)
Sprites: 8x8, 8x16, 16x16 (up to 128 on screen at a time)
The hardware is based on Sega Master System.

Sega System 16 (1985–1994)
System 16A
Main CPU: MC68000 @ 10 MHz
Sound CPU: Z80 @ 4 MHz
Sound chip: Yamaha YM2151 @ 4 MHz & NEC uPD7751 ADPCM Decoder
Video resolution: 320 x 224 (vertical)
Colour's: 4096
Board composition: CPU board + Video board
Hardware Features: 128 Sprites on screen at one time, 2 tile layers, 1 text layer, 1 sprite layer with hardware sprite zooming, translucent shadows
System 16B
Main CPU: MC68000 @ 10 MHz
Sound CPU: Z80 @ 5 MHz
Sound chip: YM2151 @ 4 MHz & Nec uPD7759 @ 640 kHz
Video resoution: 320 x 224 (vertical)
Colours: 4096
Board composition: Mother board + Rom board (see picture above)
Hardware Features: 128 Sprites on screen at one time, 2 tile layers, 1 text layer, 1 sprite layer with hardware sprite zooming, translucent shadows
The Sega System 16 is an early 16-bit arcade system board released by Sega in 1985. Over its lifespan, roughly forty games were released on this hardware, making it one of Sega's most successful arcade platforms. It was produced in two variants, the System 16A and System 16B.

In order to prevent piracy, as well as illegal bootleg games, many System 16 boards used an encryption system. A Hitachi FD1094 chip, containing the main CPU as well as the decryption key, was used in place of a regular CPU.

The System 16's pairing of a Motorola 68000 CPU and a Zilog Z80 coprocessor would prove to be a popular and durable arcade hardware configuration well into the 1990s. Capcom's CPS-1 and CPS-2 boards were built on a similar foundation, as was SNK's Neo Geo hardware. Sega would later use the 68000/Z80 combination to power its Genesis/Mega Drive home console.

Sega Space Harrier Hardware (1985–1992)
Main CPU: 2 x MC68000 @ 10 MHz
Sound CPU: Z80 @ 4 MHz
Sound Chips;
1st Configuration: YM2151 @ 4 MHz & SegaPCM @ 15.625 kHz
2nd Configuration: YM2203 @ 4 MHz & SegaPCM @ 31.250 kHz
Video Resolution: 320 x 224
Board composition: CPU board + Video board
Hardware Features: 128 Sprites on screen at one time, 2 tile layers, 1 text layer, 1 sprite layer with hardware sprite zooming, 1 road layer, translucent shadows
Sega Space Harrier, also known as Sega Hang-On, is an early 16-bit system released in 1985, originally designed for the racing game Hang-On and third-person rail shooter Space Harrier (1985). It was also used for the racing game Enduro Racer (1986). This was the first in Sega's Super Scaler series of pseudo-3D arcade hardware. At the time of its release, this was the most powerful game system.

The pseudo-3D sprite/tile scaling in Sega's Super Scaler arcade games were handled in a similar manner to textures in later texture-mapped polygonal 3D games of the 1990s. Designed by Sega AM2's Yu Suzuki, he stated that his "designs were always 3D from the beginning. All the calculations in the system were 3D, even from Hang-On. I calculated the position, scale, and zoom rate in 3D and converted it backwards to 2D. So I was always thinking in 3D."

Sega Out Run Hardware (1986–1991)
Main CPU: 2 x MC68000 @ 12.5 MHz
Sound CPU: Z80 @ 4 MHz
Sound chip: YM2151 @ 4 MHz & SegaPCM @ 15.625 kHz
Video resolution: 320 x 224
Board composition: CPU board + Video board
Hardware Features: 128 Sprites on screen at one time, 2 tile layers, 1 text layer, 1 sprite layer with hardware sprite zooming, 1 road layer and can draw 2 roads at once (i.e. for the road splits in Out Run), translucent shadows.
Sega OutRun is a 16-bit arcade system released in 1986 for the driving game Out Run (1986). It was also used for Super Hang-On (1987) and Turbo Outrun (1989). It is the second in Sega's Super Scaler series of pseudo-3D arcade hardware.

Sega X Board (1987–1990)
Main CPU: 2 x MC68000 @ 12.5 MHz
Sound CPU: Z80 @ 4 MHz
Sound chip: YM2151 4 MHz & SegaPCM @ 15.625 MHz
Video resoution: 320 x 224
Board composition: Single Board
Hardware Features: 256 Sprites on screen at one time, 4 tiles layers, 1 text layer, 1 sprite layer with hardware sprite zooming, 1 road layer, can draw 2 roads at once, translucent shadows
The Sega X Board is an arcade system board released by Sega in 1987. As the third in Sega's Super Scaler series of arcade hardware, it was noteworthy for its sprite manipulation capabilities, which allowed it to create high quality pseudo-3D visuals. This trend would continue with the Y Board and the System 32, before the Model 1 made true 3D arcade games more financially affordable.

Sega Y Board (1988–1991)
Main CPU: 3 x MC68000 @ 12.5 MHz
Sound CPU: Z80 @ 4 MHz
Sound chip: YM2151 @ 4 MHz & SegaPCM @ 15.625 MHz
Max Colours: 16384 (4bpp - 16 per sprite, which go through a 16->512 indirection table), then selects which 512 color bank to take from 4096. This is used to do colour rotations (the red-yellow rotation of the lava sprites from Galaxy force for instance) without changing the color palette, also allows it to have sprites that rotate colors and sprites that don't on the same screen, and to get different levels of luminosity as well
Sprite Structure: Uses a linked list of sprites (each sprite includes the number of the next one)
Video resoution: 320 x 224
Board composition: CPU board + Video boardBoard
The Sega Y Board is an arcade system board released by Sega in 1988. Like the X Board before it, the Y Board was known for its pseudo-3D sprite manipulation capabilities, handled by Sega's custom Super Scaler chipset.

Sega System 18 (1989–1992)
Main CPU: MC68000 @ 10 MHz
Sound CPU: Z80 @ 8 MHz
Sound chip: 2 x YM3438 @ 8 MHz & Ricoh RF5c68 @ 10 MHz (8 Channel PCM chip, remarked as Sega custom 315)
Video resoution: 320 x 224
Colours: 4096
Board composition: Main board + Rom board
Hardware Features: 128 Sprites on screen at one time, 4 tile layers, 1 text layer, 1 sprite layer with hardware sprite zooming, translucent shadows
The Sega System 18 is an arcade system board released by Sega in 1989. System 18 had a very short run of games but most boards on this hardware were JAMMA standard. Most of these games also have the "suicide battery" as associated with Sega's System 16 hardware. It also contained the VDP used by the Sega Mega Drive console.

Sega System 24 (1988–1994)
Main CPU: 2 x MC68000 @ 10MHz (one for boot, the second for the game)
Sound chip: YM2151 @ 4 MHz & DAC
Video resoution: Medium Res
Board composition: Mother board + Floppy Disk, CD-ROM or Rom Board
The Sega System 24 is an arcade system board released by Sega in 1988. It was produced for coin-operated video arcade machines until 1996. Some games released using this hardware include: Bonanza Bros., Hot Rod, and Gain Ground.

The System 24 used two Motorola 68000 processors at 10 MHz. One was for input/output, while the other was used by the game. The board holds 1360 kB of RAM and 256 kB of ROM. It was the first Sega arcade system that required a medium resolution arcade monitor. The color palette is 4352 on screen selectable from 32,768, or with shadow & highlight, 16,384 on screen selectable from 98,304. The system could support up to 2048 sprites on-screen at once.

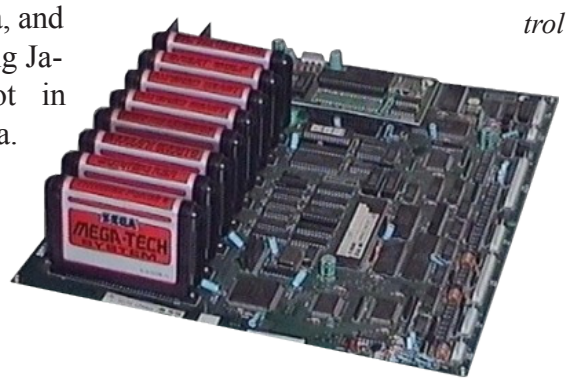
Sound was driven by a YM2151 at 4 MHz; it was capable of delivering 8 channels of FM sound in addition to a DAC used for sound effects and sampling. Early System 24s loaded their program from floppy disks. Games could also use hardware ROM boards to store games. No matter which storage device was used, a special security chip was required for each game an operator wanted to play.

Sega Mega-Tech (1988–1992)
Main CPU: MC68000 @ 7.670442 MHz, 2 x Z80 @ 3.579540 MHz
Sound chip : YM3438 @ 7.670442 MHz, 2 x SN76489 @ 3.579540 MHz
Format : There is an extra bios in the carts and they are not compatible with the Genesis console, Master System console or and Mega Play boards
Cartridge Colour : Red
Number of Slots : 8
Machine Operation : When you insert coin, you buy time, the game is finished when your time is up, You can add extra coins during the game to buy extra time
Board connector : The board uses custom connector (non-jamma)
The Sega Mega-Tech is an arcade system developed by Sega Europe in 1988. It is based on the Mega Drive/Genesis video game console hardware, and more or less identical. Its operation ability is similar to Nintendo's PlayChoice-10, where the credits bought give the user a playable time period rather than lives (usually 1 minute per credit), and can switch between games during playtime.

A few things were omitted, such as the expansion hardware allowing for Sega Mega-CD or Sega 32X as these were not developed at this point, so would not likely be offered as an arcade expansion. The PCB for the Mega-Tech also includes the ability to display to a second monitor, which contains a list of the games installed in the machine and also displays instructions for controlling the game, 1 or 2 player information, and a short synopsis of each game. The second monitor also displays the time left for playing.

Since the machine is basically a Mega Drive with timer control for arcade operations, porting games to the Mega-Tech was an easy task and so many games were released, most of them popular titles such as Streets Of Rage, Revenge Of Shinobi, Golden Axe, Sonic The Hedgehog and many more. The ability was also added for the machine to play Sega Master System titles, though fewer Master System titles were ported than Mega Drive titles. Some include the original Shinobi, Outrun and After Burner.

The Sega Mega-Tech was released in Europe, Australia, and Asia (including Japan), but not in North America.



Sega System C2 (1989–1995)
Main CPU: MC68000 @ 8.948862 Mhz
Sound chip: YM3438 @ 7.670453, SN76496 @ 3.579545
Optional Sound Chip: UPD7759 @ 640 kHz
Video resoution: 320x224
Hardware Features: Linescroll , column scroll and a raster interrupt with 2 bg planes, one with an option window, a sprite plane and several levels of priority
Board composition: One single Jamma board.
Sega's System 14, also known as System C and System C-2, is a Jamma PCB used in arcade games, introduced in 1989. This hardware is based closely on the Sega Mega Drive/Genesis hardware, with the main CPU, sound processor and graphics processor being the same, but with the addition of the Altera EPM5032 and Sega 315-5242 color encoder increasing the color palette. The CPU clock speed is slightly faster (8.94 MHz instead of 7.67 MHz), there is no Z80, and the sound chip is driven by the CPU. The DAC is also replaced by the NEC µPD7759, the same as the System 16 hardware. 17 known games were created for the System C-2 hardware.

Sega System 32 (1990–1995)
Main CPU: NEC V60 @ 16.107950 MHz (32 bits RISC CPU)
Sound CPU: Z80 @ 8.053975 MHz
Sound chip: 2 x YM3438 @ 8.053975 MHz + Ricoh RF5c68 @ 12.5 MHz (8 Channel PCM chip remarked as Sega custom 315-)*
Max Colours: 16384 (8bpp - 16 colour's per sprite)
Goes through a 16->512 indirection table, then selects which 512 color bank to take from 4096. This is used to do colour rotations (the red-yellow rotation of the lava sprites from Galaxy force for instance) without changing the color palette, also allows it to have sprites that rotate colors and sprites that don't on the same screen, and to get different levels of luminosity as well
Sprite Structure: Sprites follow each other in memory except when you stumble on a "go to "
Video resolution: 320 x 224
Board composition: Main board + Rom board
Board Features: 4 BG planes and technically infinite sprites of arbitrary size, BG planes can all be scaled and linescrolled, alpha blending, global RGB brightness control
System 32 is an arcade platform released by Sega in 1990. It succeeded the Y Board and System 24, combining features from both. It used a NEC V60 processor at 16.10795 MHz, supporting 32-bit fixed-point instructions as well as 32-bit and 64-bit floating-point instructions. It used a new custom Sega graphics chipset combining the Y Board's pseudo-3D Super Scaler capabilities with the System 24's sprite render-

ing system. Notable titles included Golden Axe: The Revenge of Death Adder, Rad Mobile, OutRunners, and SegaSonic the Hedgehog.

Sega System Multi 32 (1992–1994)
Main CPU: NEC V70 @ 20MHz (32 bits RISC CPU)
Sound CPU: Z80 @ 8.053975 MHz
Sound chip: YM3438 @ 8.053975 MHz & Sega Multi-PCM 28 channel PCM chip @ 8.053975 MHz (can access up to 4meg of sample rom)
Max Colours: 16384 (8bpp - 16 colours per sprite)
Goes through a 16->512 indirection table, then selects which 512 color bank to take from 4096. This is used to do colour rotations (the red-yellow rotation of the lava sprites from Galaxy force for instance) without changing the color palette, also allows it to have sprites that rotate colors and sprites that don't on the same screen, and to get different levels of luminosity as well
Sprite Structure: Sprites follow each other in memory except when you stumble on a "go to "
Video resoution: 320 x 224
Board composition: Main board + Rom board
Board Features: 4 BG planes and technically infinite sprites of arbitrary size, BG planes can all be scaled and linescrolled, alpha blending, global RGB brightness control
Multi 32 or System 32 Multi is another version of the System 32 hardware. This was similar to the original, but had a dual monitor display, a new NEC V70 processor at 20 MHz, a new Sega MultiPCM sound chip, more RAM, and other improvements. This was the last of Sega's Super Scaler series of pseudo-3D arcade system boards.

Sega Model 1 (1992–1994)
Main CPU: 32bits RISC NEC V60 uPD-70616 @ 16 MHz (2.5 MIPS)
Graphics Co-Processor: Fujitsu TGP MB86233 FPU 32bits 16M flops
Sound CPU: 68000 @ 12Mhz
*Sound chip: 2 x Sega MultiPCM Custom 28 channel PCM chips @ 8 MHz, 1 for Music and 1 for Effects. Each can access up to 8meg sample rom *per chip**
Sound Timing Chip: YM3834 @ 8MHz (only used for its timers)
Co-Processor Abilities: Floating decimal point operation function, Axis rotation operation function, 3D matrix operation function
Geometry: 180,000 polygons/sec, 540,000 vectors/sec
Rendering: 1,200,000 pixels/sec
Video : Shading Flat Shading, Diffuse Reflection, Specula Reflection, 2 Layers of Background Scrolling, Alpha Channel
Video resolution: 496x384 in 65536 colors
Sega went to General Electric Aerospace (who made the first 3D simulators for NASA in the 1960s) in 1991-92 for assistance to develop a CG platform architecture for their new experimental 3D system, which later became known as Model 1. Virtua racer was the game being written to find out how viable hardware 3D games were, it was never designed to be released, but it was such a success internally they decided to actually release it.

Unfortunately, seeing as it was so expensive to manufacture it was never a stunning financial success for Sega, but it did cement their place in the history books as the world leader in 3D arcade technology, a title which they still hold to this day, and it led to possibly the most popular platform ever, Model 2.

"system16.com"

Sega Mega-Play (1993)
Main CPU: MC68000 @ 7.670442 MHz, 2 x Z80 @ 3.579540 MHz
Sound chip: YM3438 @ 7.670442 MHz, 2 x SN76489 @ 3.579540 MHz
Format: Uses Genesis only based games (not master system like the Mega-Tech), and there is an extra bios in the carts which are not compatible with the Genesis console or the Mega-Tech board
Cartridge Colour: Black / White Labels
Number of Slots: 4
Machine Operation: When you insert coins you buy credits just like a standard arcade video game. Game ends at game over as normal.
Board connector: Jamma compatible
The successor to the Sega Mega-Tech, the Mega-Play, is a JAMMA based system. This system utilized only 4 carts instead of 8. This version also utilizes traditional arcade operations, in which credits bought are used to buy lives instead.

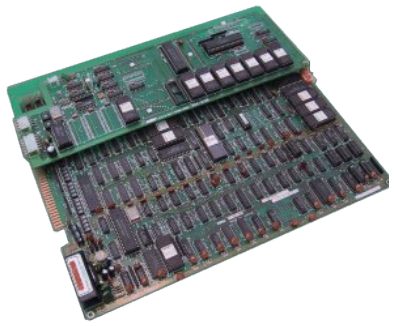
Like the Mega-Tech, The Sega Mega-Play was released in Europe, Australia, and Asia (including Japan), but not in North America.

Sega Model 2 (1994)
Main CPU: Z80 @ 4 MHz
Sound CPU: Z80 @ 4 MHz
Sound chip: SN76496 @ 2 MHz, SN76496 @ 4 MHz
Video resoution: 256 x 224
Board composition: Main board & rom board.
Hardware Features: 2 layers+sprites, hardware collision detection
The Sega Model 2 is an arcade system board released by Sega in 1993. Like the Model 1, it was developed in cooperation with Martin Marietta, and is a further advancement of the earlier Model 1 system. The most noticeable improvement was texture mapping, which enabled polygons to be painted with bitmap images, as opposed to the limited monotone flat shading that Model 1 supported. The Model 2 also introduced the use of texture filtering and texture anti-aliasing.

Designed by Sega AM2's Yu Suzuki, he stated that the Model 2's texture mapping chip originated "from military equipment from Lockheed Martin, which was formerly General Electric Aerial & Space's textural mapping technology. It cost $2 million to use the chip. It was part of flight-simulation equipment that cost $32 million. I asked how much it would cost to buy just the chip and they came back with $2 million. And I had to take that chip and convert it for video game use, and make the technology available for the consumer at 5,000 yen ($50)" ($85 in 2017) per machine. He said "it was tough but we were able to make it for 5,000 yen. Nobody at Sega believed me when I said I wanted to purchase this technology for our games." There were also issues working on the new CPU, the Intel i960-KB, which had just released in 1993. Suzuki stated that when working "on a brand new CPU, the debugger doesn't exist yet. The latest hardware doesn't work because it's full of bugs. And even if a debugger exists, the debugger itself is full of bugs. So, I had to debug the debugger. And of course with new hardware there's no library or system, so I had to create all of that, as well. It was a brutal cycle."

Despite its high pricetag, the Model 2 platform was very successful, and in early 1996 Sega began licensing the board to its competitors. The Model 2 featured some of the highest grossing arcade games of all time: Daytona USA, Virtua Fighter 2, Cyber Troopers Virtual-On, The House of the Dead, and Dead or Alive.

Model 2 has four different varieties: Model 2 (1993), Model 2A-CRX (1994), Model 2B-CRX (1994) and Model 2C-CRX (1996). While Model 2 and 2A-CRX use a custom DSP with internal code for the geometrizer, 2B-CRX and 2C-CRX use well documented DSPs and upload the geometrizer code at startup to the DSP. This, combined with the fact that some games were available for both 2A-CRX and 2B-CRX, led to the reverse engineering of the Model 2 and Model 2A-CRX D-SPs.



Sega Model 2A-CRX (1994–1999)
Main CPU: Intel i960-KB @ 25 MHz 32bits RISC
Co-Processors: 5 x Fujitsu TGP FPU 32bits 16M flops (Floating Point, Stem Rotate, 3D Matrix)
Video resolution: 496x384 in 65536 colors
Geometry: 300,000 polygons/s. 900,000 vectors/s
Rendering: 1,200,000 pixels/s
Video: Shading Flat Shading, Perspective Texture, Micro Texture, Multi Window, Diffuse Reflection Mode, Specular Reflection Mode
Sound CPU: 16bits 68000 @ 11.2896 Mhz
Memory RAM: 4 M-bits
Memory ROM: 68 M-bits (max.)
Sound chip: SCSP/YMF292-F (315-5687) LAKE @ 11.3MHz
44.1 khz Sampling Rate
32 Channels, 16 bits, 2 channel output
Model 2A-CRX is a variant of Sega Model 2. Sega had always envisioned their 3D system to be textured, never just flat shaded 3D, so with this in mind they kept their relation going with GEA (now known as Martin Marietta after being bought by them in 1993) and worked with SEGA to upgrade the Model 1 graphics, including the new texture mapping features among other effects.

Sega Model 2B-CRX (1995–1999)
Main CPU: Intel i960-KB @ 25 MHz 32bits RISC
Co-Processor: 2 Analog Devices SHARC FPU 32bits 16M flops
Co-Processor Abilities: Floating decimal point operation function, Axis rotation operation function, 3D matrix operation function.
Memory RAM: 8 M-Bits + 1 M-bit
Memory ROM: 720 M-bits (max.)
Video resolution: 496x384 24Hz Horizontal sync, wave, non interlace.
Scroll Surfaces: 2 Surfaces, Horizontal line scroll, 16 colours x 123 colour palettes / 32,768 colours
Window Surfaces: 2 Surfaces, Horizontal line scroll, 16 colours x 123 colour palettes / 32,768 colours
3D Graphics Engine: Built in floating decimal point unit. 900,000 vectors/sec (max.) 300,000 polygons/sec (max.)
Polygon Surfaces: 2,000,000 pixels/frame (60 frames/sec)
1,024 colour palettes x 64 luminance tables, 16,777,216 colours.
Texturing Information: Perspective Texture, 16 shade mono texture
Map size: 1024x2048x2 (sheets)
Micro Texture: 128x128x8 Sheets
Translator Map: 128 shades x 256 sets
Transparent 1 shade, checker board, texture antialiasing.
Advanced communications function, can link many machine together.
Sound CPU: 16bits 68000 11.2896 Mhz
Memory RAM: 4 M-bits
Memory ROM: 68 M-bits (max.)
Sound chip: SCSP/YMF292-F (315-5687) LAKE @ 11.3MHz
44.1 khz Sampling Rate
32 Channels, 16 bits, 2 channel output
Model 2B-CRX is a variant of Sega Model 2.

Sega ST-V (1995–2001)
Main CPUs: 2 x Hitachi SH-2 @ 28.6364 MHz
Sound CPU: MC68000 @ 11.45456 MHz
Sound chip: SCSP/YMF292-F (315-5687)/"LAKE" @ 11.3MHz, 32 PCM (Pulse Code Modulation) Channels, 44.1 khz Sampling Rate
Secondary CPUs;
SCU DSP: fixed point maths coprocessor, up to 4 parallel instructions.
VDP 1: 32-bit video display processor : sprite and polygon, dual 256KB frame buffers for rotation and scaling effects, Texture Mapping, Goraud Shading, 512KB cache for textures
VDP 2: 32-bit background and scroll plane video display processor, 2 Windows for special calculations, transparency, shadowing, background engine, 5 simulataneous scrolling backgrounds, 2 simultaneous rotating playfields, up to 60 frames per second animation
Main RAM: 2 Megabytes (16 megabits)
VRAM: 1.54 Megabytes (12 megabits)
Audio RAM: 512 Kilobytes (4 megabits)
Rendering Speed: 200,000 Texture Mapped Polygons/Second, 500,000 Flat Shaded Polygons/Second
Colours: 24-bit true color graphics, 16. Million Available Colors
Resolution: 320x224, 640x224, and 720x576 horizontal and 240, 448, and 480 vertical
Board composition: Main board + Game cartridge (one or more in the same time)
Game Cartridge Size: Max size = 384mbit (48meg)
The board is Jamma and uses a standard resolution monitor
ST-V (Sega Titan Video game system) is an arcade system board released by Sega in 1994. Departing from their usual process of building custom arcade hardware, Sega's ST-V is essentially identical to the Sega Saturn home console system. The only difference is the media: ST-V used ROM cartridges instead of CD-ROMs to store games. Being derived from the Saturn hardware, the ST-V was presumably named after the moon Titan, a satellite of Saturn.

The majority of ST-V titles were released in Japan only, but a notable exception was the port of Dynamite Deka, which became Die Hard Arcade. Games released for the ST-V include Virtua Fighter Remix, Golden Axe: The Duel and Final Fight Revenge. The shared hardware between Saturn and ST-V allowed for very accurate ports for the Saturn console.

The manufacturer of the American STV-Titan dedicated cabinets (which were plastic) was mainly a manufacturer of waste storage containers, molded plastic stuff and whatnot. Turned out prescient as that's pretty much how the market received them; as garbage cans.

Sega System H1 (1995–1996)
Board composition: CPU Board, Video Board, Communication Board, ROM Board
Main CPU: Hitachi SH-2 @ 28.63636 MHz (32-bit, 28.63636 MIPS)[4]
Sub-CPU: Hitachi SH-1 @ 16 MHz (32-bit, 16 MIPS)[4]
Sound CPU: Toshiba TMP68HC000N @ 16 MHz (16/32-bit, 2.8 MIPS)
Sound processors: 2× Yamaha YMF292 (SCSP)[7]
GPU: Sega 837-9621 Video Board @ 50 MHz
Memory: Up to 94.3 MB (6276 KB main, 85.125 MB video, 3 MB sound)
System RAM: 8452 KB (8.254 MB)
Display resolution: 2 monitors: 640×224 to 992×384 (320×224 to 496×384 per monitor)
The Sega H1 Board is an arcade board made by Sega. Released in 1995, it was a successor to the Sega System 32 and was the last Super Scaler arcade system board (using sprite/texture scaling for three-dimensional graphics). Hardware-wise, it crosses the bridge between the System 32 and the Sega Model 1 and Model 2. The H1 Board also uses hardware similar to the Sega Saturn and ST-V. Only two games are known to use the H1 Board; Cool Riders (1995) and Aqua Stage (1995).

"segaretro.org"

WhiteStar (1995–2004)
Main CPU: Motorola 6809 at 2 MHz
Display CPU: Motorola 6809 at 2 MHz
Sound CPU: Motorola 6809 at 2 MHz (CPU/Sound Board), Atmel AT91SAM at 40 MHz (CPU/Sound Board II)
Sound chips: BSMT2000 at 24 MHz (CPU/Sound Board), 3x Xilinx FPGAs (CPU/Sound Board II)
The WhiteStar Board System was an arcade system board used for several pinball games designed by Sega Pinball and their successor, Stern Pinball, between 1995 and 2005. It is the successor to Data East Pinball/Sega Pinball's Version 3 system, derived from System 11 hardware, copied from Williams.

1995's Apollo 13 was the first game to use the WhiteStar System, and 2005's NASCAR (Grand Prix outside the US) was the final game to use the WhiteStar System.

It is succeeded by Stern's "S.A.M. System", which was first used in 2006's World Poker Tour.

In 2003, when The Lord of the Rings was released, the WhiteStar's audio hardware underwent major changes. The Motorola 6809/BSMT2000 sound system was changed to a 32-bit Atmel AT-91SAM CPU with three Xilinx FPGAs. This adds hardware emulation of the 6809-BSMT2000 system for backwards-compatibility with previous WhiteStar-based games (some late Terminator 3 machines were actually shipped using this replacement board), as well as adding 16-bit ADPCM compression for the audio. The 16-bit audio is used from Lord of the Rings to NASCAR / Grand Prix.

This revised board is called the CPU/Sound Board II (or the CPU/Sound II Board) in the official schematics.

Sega Model 2C-CRX (1996–1999)
Main CPU: Intel i960-KB @ 25 MHz 32bits RISC
Co-Processors : Fujitsu TGPx4 MB86235 FPU 32bits 16M flops
Co-Processor Abilities: Floating decimal point operation function, Axis rotation operation function, 3D matrix operation function.
Memory RAM: 8 M-Bits + 1 M-bit
Memory ROM: 720 M-bits (max.)
Video resolution: 496x384 24Hz Horizontal sync, wave, non interlace.
Scroll Surfaces: 2 Surfaces, Horizontal line scroll, 16 colours x 123 colour palettes / 32,768 colours
Window Surfaces: 2 Surfaces, Horizontal line scroll, 16 colours x 123 colour palettes / 32,768 colours
3D Graphics Engine: Built in floating decimal point unit. 900,000 vectors/sec (max.) 300,000 polygons/sec (max.)
Polygon Surfaces: (at least) 2,000,000 pixels/frame (60 frames/sec)
1,024 colour palettes x 64 luminance tables, 16,777,216 colours.
Texturing Information: Perspective Texture, 16 shade mono texture
Map size: 1024x2048x2 (sheets)
Micro Texture: 128x128x8 Sheets
Translator Map: 128 shades x 256 sets
Transparent 1 shade, checker board, texture antialiasing.
Advanced communications function, can link many machine together.
Sound CPU: 16bits 68000 11.2896 Mhz
Memory RAM: 4 M-bits
Memory ROM: 68 M-bits (max.)
Sound chip: SCSP YMF292-F (315-5687) LAKE @ 11.3MHz
44.1 khz Sampling Rate
32 Channels, 16 bits, 2 channel output
Model 2C-CRX is a variant of Sega Model 2.

Sega Model 3 Step 1.0 (1996–1997)
Main CPU: 32bits RISC PowerPC 603 66Mhz
Graphics Chip: 2 x Lockheed Martin Real3D/PRO-1000
Sound CPU: 16bits 68EC000 11.3Mhz
Sound chip: Yamaha SCSP/YMF-292F/"LAKE" FH1 128-step DSP x 2, MIDI interface, 16 bits 64 voices 4 channel, maximum of 16.5 Mbytes ROM, 64 PCM channels
Audio RAM: 1meg (8 megabits, 512K per SCSP chip)
Main Memory: 8 Mbytes 66mhz Ram, graphic ROM maximum of 64 Mbytes, backup RAM 64 Kbytes
Video resolution: 24KHz 496(H)x384(V) one or two plane 24khz, It uses the VGA pinout however. And, the voltage levels of the video output is at VGA levels (.7vdc Peak to Peak)
Scroll Window: two plane (24KHz/two plane mode), 16 colours/32,768 1024 palette x 2 bank, 256/32,768 64 palette x 2 bank
Geometrizer: 1,000,100 polygons/s for square polys, 2,000,200 for Triangle polys
Renderer: 60,000,000 pixels/s
Video: Full Color Texture Mapping, Tri-Linear Interpolation, Micro Texture, Shading High-Specula Gouraud Shading, Fix Shading, Flat Shading, Texture & Edge Multi Layered Anti-Allasing, Lighting Effects, Parallel Light, 4 Spot Light, Pin Spot Light, Special Effect Zoning-Fog, 32 Levels of Translucency.
Board composition: CPU + VIDEO + ROM boards
Others: 10mbs Connection, calendar IC
The Sega Model 3 is an arcade system board released by Sega in 1996. It was the culmination of Sega's partnership with Lockheed Martin, using the company's Real3D division to design the graphical hardware. It was first unveiled at the 1996 AOU show. Upon release, the Model 3 was easily the most powerful arcade system board in existence, capable of over one million quad polygons per second and over two million triangular polygons per second.The hardware went through several "steppings," which increased the clock speed of the CPU and the speed of the 3D engine, as well as minor changes to the board architecture. Step 1.0 and Step 1.5 released in 1996, Step 2.0 in 1997, and Step 2.1 in 1998.

Well known Model 3 games include Virtua Fighter 3 (1996), Sega Super GT (1996), Harley-Davidson & L.A. Riders (1997), Sega Bass Fishing (1997), Daytona USA 2 (1998), Sega Rally 2 (1998), and The Ocean Hunter (1998), although it is the rarest of them. By 2000, the Sega Model 2 & 3 had sold over 200,000 arcade systems worldwide.

Sega Model 3 Step 1.5 (1996–1998)
Main CPU: 32bits RISC PowerPC 603 100Mhz
Graphics Chip: 2 x Lockheed Martin Real3D/PRO-1000
Sound CPU: 16bits 68EC000 11.3Mhz
Sound chip: Yamaha SCSP/YMF-292F/"LAKE" FH1 128-step DSP x 2, MIDI interface, 16 bits 64 voices 4 channel, maximum of 16.5 Mbytes ROM, 64 PCM channels
Audio RAM: 1meg (8 megabits, 512K per SCSP chip)
Main Memory: 8 Mbytes 66mhz Ram, graphic ROM maximum of 64 Mbytes, backup RAM 64 Kbytes
Video resolution: 24KHz 496(H)x384(V) one or two plane 24khz, It uses the VGA pinout however. And, the voltage levels of the video output is at VGA levels (.7vdc Peak to Peak)
Scroll Window: two plane (24KHz/two plane mode), 16 colours/32,768 1024 palette x 2 bank, 256/32,768 64 palette x 2 bank
Geometrizer: At least 1,000,100 polygons/s for square polys, 2,000,200 for Triangle polys
Renderer: At least 60,000,000 pixels/s
Video: Full Color Texture Mapping, Tri-Linear Interpolation, Micro Texture, Shading High-Specula Gouraud Shading, Fix Shading, Flat Shading, Texture & Edge Multi Layered Anti-Allasing, Lighting Effects, Parallel Light, 4 Spot Light, Pin Spot Light, Special Effect Zoning-Fog, 32 Levels of Translucency.
Board composition: CPU + VIDEO + ROM boards
Others: 10mbs Connection, calendar IC

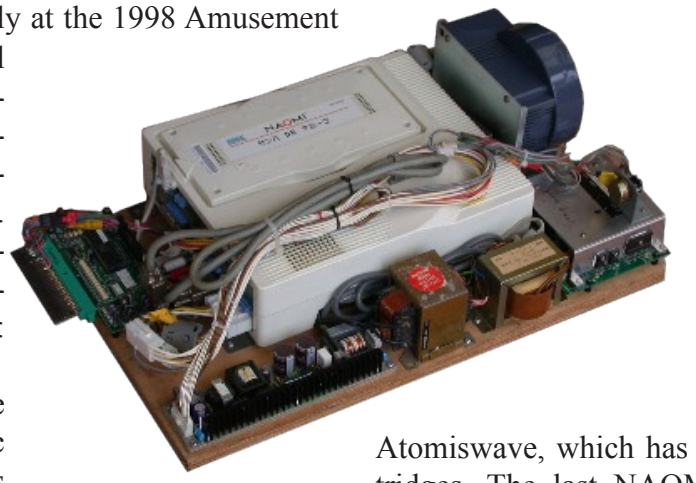
Sega Model 3 Step 2.0 (1997–1998)
Main CPU: 32bits RISC PowerPC 603ev 166Mhz
Graphics Chip: 2 x Lockheed Martin Real3D/PRO-1000
Sound CPU: 16bits 68EC000 11.3Mhz
Sound chip: Yamaha SCSP/YMF-292F/"LAKE" FH1 128-step DSP x 2, MIDI interface, 16 bits 64 voices 4 channel, maximum of 16.5 Mbytes ROM, 64 PCM channels
Audio RAM: 1meg (8 megabits, 512K per SCSP chip)
Main Memory: 8 Mbytes 66mhz Ram, graphic ROM maximum of 64 Mbytes, backup RAM 64 Kbytes

Video resolution: 24KHz 496(H)x384(V) one or two plane 24khz, It uses the VGA pinout however. And, the voltage levels of the video output is at VGA levels (.7vdc Peak to Peak)
Scroll Window: two plane (24KHz/two plane mode), 16 colours/32,768 1024 palette x 2 bank, 256/32,768 64 palette x 2 bank
Geometrizer: At least 1,000,100 polygons/s for square polys, 2,000,200 for Triangle polys
Renderer: At least 60,000,000 pixels/s
Video: Full Color Texture Mapping, Tri-Linear Interpolation, Micro Texture, Shading High-Specula Gouraud Shading, Fix Shading, Flat Shading, Texture & Edge Multi Layered Anti-Allasing, Lighting Effects, Parallel Light, 4 Spot Light, Pin Spot Light, Special Effect Zoning-Fog, 32 Levels of Translucency.
Board composition: CPU + VIDEO + ROM boards
Others: 10mbs Connection, calendar IC

Sega Model 3 Step 2.1 (1998–1999)
Main CPU : 32bits RISC PowerPC 603ev 166Mhz
Graphics Chip : 2 x Lockheed Martin Real3D/PRO-1000
Sound CPU : 16bits 68EC000 11.3Mhz
Sound chip : Yamaha SCSP/YMF-292F/"LAKE" FH1 128-step DSP x 2, MIDI interface, 16 bits 64 voices 4 channel, maximum of 16.5 Mbytes ROM, 64 PCM channels
Audio RAM : 1meg (8 megabits, 512K per SCSP chip)
Main Memory : 8 Mbytes 66mhz Ram, graphic ROM maximum of 64 Mbytes, backup RAM 64 Kbytes
Video resolution : 24KHz 496(H)x384(V) one or two plane 24khz, It uses the VGA pinout however. And, the voltage levels of the video output is at VGA levels (.7vdc Peak to Peak)
Scroll Window : two plane (24KHz/two plane mode), 16 colours/32,768 1024 palette x 2 bank, 256/32,768 64 palette x 2 bank
Geometrizer : At least 1,000,100 polygons/s for square polys, 2,000,200 for Triangle polys
Renderer : At least 60,000,000 pixels/s
Video : Full Color Texture Mapping, Tri-Linear Interpolation, Micro Texture, Shading High-Specula Gouraud Shading , Fix Shading, Flat Shading, Texture & Edge Multi Layered Anti-Allasing, Lighting Effects, Parallel Light, 4 Spot Light, Pin Spot Light, Special Effect Zoning-Fog, 32 Levels of Translucency.
Board composition : CPU + VIDEO + ROM boards
Others : 10mbs Connection, calendar IC

Sega NAOMI (1998–2009)
CPU: Hitachi SH-4 32-bit RISC CPU (200 MHz 360 MIPS / 1.4 GFLOPS)
Graphic Engine: PowerVR 2 (PVR2DC)
Sound Engine: ARM7 Yamaha AICA 45 MHZ (with internal 32-bit RISC CPU, 64 channel ADPCM)
Main Ram: 32 megs
Main Memory: 32 MByte
Graphic Memory: 16 MByte
Sound Memory: 8 MByte
Media: ROM Board (maximum size of 172MBytes) / GD-Rom
Simultaneous Number of Colors: Approx. 16,770,000 (24bits)
Polygons: 2.5 Million polys/sec
Rendering Speed: 500 M pixel/sec
Additional Features: Bump Mapping, Fog, Alpha-Bending (transparency), Mip Mapping (polygon-texture auto switch), Tri-Linear Filtering, Anti-Aliasing, Environment Mapping, and Specular Effect.

The NAOMI (New Arcade Operation Machine Idea) is the successor to the Sega Model 3. Sega first demonstrated NAOMI publicly at the 1998 Amusement Machine Show (an annual trade show hosted in Tokyo by the Japan Amusement Machinery Manufacturers Association). After the show, Sega released the first NAOMI title to the Japanese market: The House of the Dead 2.



NAOMI uses some of the same electronic components as Sega's Dreamcast home game console: Hitachi SH-4 CPU, PowerVR Series 2 GPU (PVR2DC), and Yamaha AICA Super Intelligent Sound Processor based sound system. However, NAOMI has twice as much system memory, twice as much video memory, and four times as much sound memory.

Multiple NAOMI boards can be clustered to improve graphics performance and to support multiple-monitor output. A special game cabinet for the NAOMI, NAOMI Universal Cabinet, houses up to sixteen boards for this purpose. Multiple-board variants are referred to as NAOMI Multiboard hardware, which debuted in 1999.

Sega's NAOMI Satellite Terminal Hardware infrastructure enabled developers to make games with multiple control terminals, so several people could sit and play a game that has one large screen. The Satellite Terminal Hardware links up to 10 NAOMI boards. Multi-terminal systems like this made use of Memory Card Reader and Dispenser (MCRD) technology. Derby Owners Club (2000) and World Club Champion Football (2002) are two applications of these technologies.

Some NAOMI titles read game data from a GD-ROM optical disc, which is also the Dreamcast's software medium. Game data can also be stored in a 168-megabyte bank of solid-state ROM. GD-ROM support requires a specialized DIMM board in addition to the GD-ROM drive. When the NAOMI powers-on, it copies data from the comparatively slow GD-ROM to the faster DIMM memory. Thereafter, the game executes entirely in RAM.

Unlike Sega's previous arcade platforms (and most other arcade platforms in the industry), NAOMI is widely licensed for use by other game publishers. Among the licensees were Nintendo (which only licensed one game, Rhythm Tengoku: HD Remixed Edition), Bandai Namco Games, Capcom, Sammy Corporation, and Tecmo. Some of the games developed by licensees were Mazan, Marvel vs. Capcom 2: New Age of Heroes (Capcom 2000), Rhythm Tengoku (Nintendo 2007), Dead or Alive 2 (Tecmo 1999) and Guilty Gear XX (Sammy 2002). Sammy developed a derivative platform, the Atomiswave, which has interchangeable game cartridges. The last NAOMI titles were released in 2008: Sega's Melty Blood: Actress Again and Subtle Style's Akatsuki Blitzkampf Ausf. Achse.

Sega Hikaru (1999–2002)
CPU: 2 x Hitachi SH-4 128 bit RISC CPU with graphic functions @ 200 MHz 360 MIPS / 1.4 GFLOPS
Graphic Engine: Sega Custom 3D
Sound Engine: 2x ARM7 Yamaha AICA @ 45 MHz with internal 32-bit RISC CPU, 64 channel ADPCM
Main Memory: 64 Mbytes
Graphic Memory: 28 Mbytes
Sound Memory: 8 Mbytes
Media: ROM Board (max 352 MBytes)
Simultaneous Number of Colors: Approx. 16,770,000 (24bits)
Resolution: 24 KHz, 496x384, 31 KHz 640x480
Polygons: 2 Million polys a sec
Shading: Phong Shading
Lighting: Horizontal, Spot, 1024 lights per scene, 4 lights per polygon, 8 window surfaces.
Effects: (at least) Phong Shading, Fog, Depth Queueing, Stencil, Shadow, Motion blur
Others Capabilties : Bitmap Layer x 2, Calender, Dual Monitor (24 kHz)
Extensions: communication, 4 channel audio, PCI, MIDI, RS-232C
Connection: Jamma Video complient

An evolution of the NAOMI hardware with supe-

rior graphics capabilities, the Hikaru was used for a handful of deluxe dedicated-cabinet games, beginning with 1999's Brave Fire Fighters, in which the flame and water effects were largely a showpiece for the hardware. The Hikaru hardware was the first arcade platform capable of effective Phong shading.

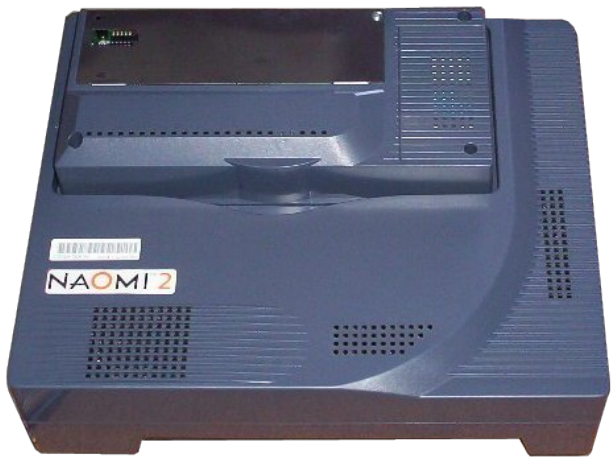
According to Sega in 1999: "Brave Firefighters utilizes a slightly modified Naomi Hardware system called Hikaru. Hikaru incorporates a custom Sega graphics chip and possesses larger memory capacity than standard Naomi systems. "These modifications were necessary because in Brave Firefighters, our engineers were faced with the daunting challenge of creating 3d images of flames and sprayed water," stated Sega's Vice President of Sales and Marketing, Barbara Joyiens. "If you stop and think about it, both have an almost infinite number of shapes, sizes, colors, levels of opaqueness, shadings and shadows. And, when you combine the two by simulating the spraying of water on a flame, you create an entirely different set of challenges for our game designers and engineers to overcome; challenges that would be extremely difficult, if not impossible to overcome utilizing existing 3D computers. Hikaru has the horsepower to handle these demanding graphic challenges with clarity, depth and precision." In addition, the Hikaru also uses two Hitachi SH-4 CPU's, two Yamaha AICA sound engines, a Motorola 68000 network CPU, and two PowerVR2 GPU's.

Since it was comparatively expensive to produce, and most games did not necessarily need Hikaru's extended graphics capabilities, Sega soon abandoned the system in favor of continued NAOMI and NAOMI 2 development.

Sega NAOMI 2 (2001–2006)
CPU: 2 x Hitachi SH-4 32-bit RISC CPU (200 MHz 360 MIPS / 1.4 GFLOPS)
Graphic Engine: 2 x PowerVR 2 (PVR2DC-CLX2) GPU's - (under the fans)
Geometry Processor: Custom Videologic T+L chip "Elan" (100mhz) - (Under Heatsink)
Sound Engine: ARM7 Yamaha AICA 45 MHZ (with internal 32-bit RISC CPU, 64 channel ADPCM)
Main Memory: 32 MByte 100Mhz SDRAM
Graphic Memory: 32 MByte
Model Data Memory: 32MByte
Sound Memory: 8 MByte
Media: ROM Board / GD-Rom
Simultaneous Number of Colors: Approx. 16,770,000 (24bits)
Polygons: 10 Million polys/sec with 6 light sources
Rendering Speed : 2000 Mpixels/sec (unrealistic max, assumes overdraw of 10x which nothing uses)
Additional Features: Bump Mapping, Multiple Fog Modes, 8-bit Alpha Blending (256 levels of transparency), Mip Mapping (polygon-texture auto switch), Tri-Linear Filtering, Super Sampling for Full Scene Anti-Aliasing, Environment Mapping, and Specular Effect.
Compatibility: Fully backwards compatible with all Naomi and GD-Rom games.

In 2000, Sega debuted the NAOMI 2 arcade system board at JAMMA, an upgrade and a sequel of the original NAOMI with better graphics capability.

NAOMI 2's graphics-assembly contains two PowerVR CLX2 GPUs, a PowerVR Elan chip for geometry transformation and lighting effects, and 2X the graphics memory for each CLX2 chip. (Each CLX2 has its own 32MB bank, as the CLX2s cannot share graphics RAM). Due to architectural similarities and a "bypass" feature in the Elan device, the NAOMI 2 is also able to play NAOMI games (except for The House of the Dead 2) without modification.



With the NAOMI 2, Sega brought back the GD-ROM drive. For both NAOMI and NAOMI 2, the GD-ROM setup was offered as an optional combination of daughterboard expansion known as the DIMM Board, and the GD-ROM drive itself. The DIMM board contained enough RAM to allow an entire game to be loaded into memory at start up, allowing the drive to shut down after the game has loaded. This heavily reduces load times during the game, and saves on drive wear and tear.

Triforce (2002–2006)
"see Namco System Board page on Triforce"

Sega Chihiro (2002–2008)
System: X-Box based configuration.
CPU: Intel Pentium III 733MHz (133MHz FSB)
Graphics : nVidia XChip 200MHz (based on the nVidia GeForce 3)
Sound Hardware:
- Cirrus Logic CS4630 Stream Processor (20-bit DAC, programmable to handle 3D sound streams, 2D sound (including DLS-compatible MIDI), MP3 acceleration, Sensaura environmental effects, and other functions)
- Other sounds may be generated by the CPU via software engines.
- nVidia nForce (Real time Dolby Digital 5.1 encoding)
RAM : Upgradable Module, from 64MB upwards (Outrun 2 has 512MB)
Media : Sega GD-Rom
Polygons : 125M Polys/sec (Theoretical Maximum)
Rendering Speed : 4.0 G pixel/sec
Features : Programmable vertex and pixel shading, hardware Transform & Lighting engine, Quincunx FSAA, Anisotropic filtering, bump mapping, hardware lighting, particle effects, other standard 3D features).

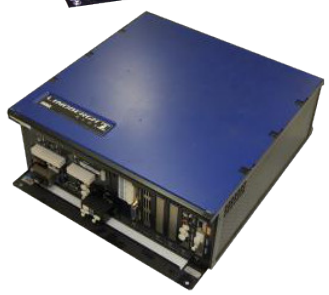
The Sega Chihiro system is a Sega arcade system board based on the architecture of the Xbox. The 733 MHz Intel Pentium III CPU and the Nvidia XChip graphics processor are common to both, but the Chihiro has a different MCPX chip with unique bootloader keys. The main system memory, at 128 MB, is twice that of a retail Xbox. In addition to this memory, the Chihiro also has additional RAM used for media storage - this was initially 512 MB but is upgradable to 1 GB. When the system is booted, the required files are copied from the GD-ROM to the RAM on the media board.

Because the Chihiro and Xbox share the same hardware architecture, porting from the Chihiro is theoretically easier than porting from a different arcade platform. In practice, there are a number of challenges - the first being that the half-size main memory restricts the size of your working set and the second being that fetching assets from Xbox DVD drive is orders of magnitude slower than fetching them from the 512MB/1GB of RAM on the media board. These challenges are not insurmountable, though - for example, the Xbox release of OutRun 2 was able to retain the look and feel of the original arcade version.

Sega System SP (2004–2009)
CPU: Hitachi SH-4 32-bit RISC CPU (200 MHz 360 MIPS / 1.4 GFLOPS)
Graphic Engine: PowerVR2 (PVR2DC)
Sound Engine: ARM7 Yamaha AICA 45 MHZ (with internal 32-bit RISC CPU, 64 channel ADPCM)
Main Memory: 32 MByte
Graphic Memory: 16 MByte
Sound Memory: 8 MByte
Network: CPU - AMD AU1500-333MBD, BOOT - 2MByte Flash, RAM - 8Mbyte, Ethernet PHY
Game Media: Compact Flash 256Mbyte
On Board Program Storage: 128Mbyte (8x128MBit or 2x512Mbit) or 512Mbyte (8x512Mbit) Flash Memory

Security IC: PIC16 Dongle
Simultaneous Number of Colors: Approx. 16,770,000 (24bits)
Polygons: 2.5 Million polys/sec
Rendering Speed: 500 M pixel/sec
Additional Features: Bump Mapping, Fog, Alpha-Blending (transparency), Mip Mapping (polygon-texture auto switch), Tri-Linear Filtering, Anti-Aliasing, Environment Mapping, and Specular Effect.
System SP is a refactored NAOMI system with integrated FlashROM board, CF interface and networking.

Sega Lindbergh (2005–2015)



The Sega Lindbergh arcade system board is an embedded PC running MontaVista Linux (The Lindbergh Blue system used Windows Embedded instead). Sega had initially planned to use Microsoft's Xbox 360 as the basis for the arcade board, but instead opted for an architecture based on standard PC hardware.

According to Sega-AM2 president Hiroshi Kataoka, porting Lindbergh titles (such as Virtua Fighter 5) to Sony's PlayStation 3 is generally easier than porting to Xbox 360, because the Lindbergh and PS3 use a GPU designed by the same company, Nvidia.

CPU (Blue): Intel Pentium 4 3.0G HT (800Mhz FSB - 1MB L2 Cache)
CPU (Red): Intel Celeron 2.8ghz
CPU (Yellow): Intel Pentium 4 3.0G HT (800Mhz FSB - 1MB L2 Cache)
GFX (Blue): NVIDIA GeForce 6 Series GPU
GFX (Red): NVIDIA GeForce 7600gs 256mb AGP
GFX (Yellow): NVIDIA GeForce 6 Series GPU
GFX Memory: 256MB (256 bit GDDR3)
Operating System: Montavista Linux
GFX Capabilities: Vertex Shader 3.0, Pixel Shader 3.0
Audio: PCI Sound Card - 3D audio synthesizer chip onboard, possible to have 64 sounds playing simultaneously, 5.1 surround output.
Video output: One analog D-Sub, Two Digital DVI outputs.
Display: Single or dual monitor support. Can output the same picture to each monitor or different pictures on each monitor, the resolution for each of the 2 monitors can also be different.
Sound output: The two front speakers have RCA connectors, SPDIF for full surround.
Resolution: HDTV (High Definition)
RAM: 1024MB 184pin DDR SD-RAM PC3200 (2x 512MB DDR 400 sticks)
LAN: 10/100/1000 TBase Gigabit Network
Other: DVD Drive Support, USB2.0 (x4) - Sega ALL. Connector Format: JVS
Protection: A PIC microcontroller, looking similar to the one used on NAOMI/Triforce/Chihiro but containing considerably different information, locking both the HDD and Compact Flash Cards.

Sega Europa-R (2008–2010)
CPU: Intel Pentium Dual-Core 3.4 GHz
RAM: 8GB (2x 4GB modules)
GPU: NVIDIA GeForce 8800
Protection: High Spec original security module.
Other: HDTV Compatible, DVD Drive Support, Sega ALL.NET online support
The Sega Europa-R is an arcade system board developed by Sega Amusements Europe.

Sega chose a PC-based design for this arcade board. This arcade board currently only runs two games, Sega Rally 3 and Race Driver: GRID (Stylized as simply GRID).

Sega PC Based (2010–)
The hardware is standard PC based.

The Ring series of arcade machines are based on PC architecture. Initially announced models include RingEdge and RingWide. The 2 pieces of hardware have Microsoft Windows Embedded Standard 2009 as their operating system, mainly so other third-party companies would find it easier to produce games for the system.

Sega RingWide (2009–2012)
CPU: Intel Celeron 440 @ 2 GHz
Graphics: Integrated "AMD GPU" with 128MB of GDDR3 RAM, supports Shader Model 4.0 and supports 2x 1920×1200 screens
Audio: 5.1 ch HD Audio
RAM: 1GB of DDR2 PC5300 RAM
Network: Onboard gigabit LAN
Storage: 8GB Compact Flash for storage
Operating System: Microsoft Windows Embedded Standard 2009
The RingWide is more basic than the RingEdge, and only has 8 GB (CompactFlash) of storage, while RingEdge has four times larger storage (because of the use of the RAM Drive and SSD). The RingWide will be used to run games that are less graphics-intensive and that require less high-end specifications in order to cut down costs. Sega also appears poised to be designing a streaming hybrid for use with household TVs, similar to OnLive from the system's hardware as evident from this patent issued by them on November 17, 2009.

Sega RingEdge (2009–)
CPU: Intel Pentium E2160 CPU @ 1.8 GHz
Graphics: A "nVidia GPU" 384MB of GDDR3 RAM and supports Shader Model 4.0 and 2x 1920×1200 displays.
Audio: 5.1 ch HD Audio
Memory: 1GB de DDR2 PC2-6400 RAM
Network: Onboard Gigabit LAN, Compatible ALL.Net
Storage: 32GB SSD drive for storage
Operating System: Microsoft Windows Embedded Standard 2009
The RingEdge is the main console of the Ring Series. It has better graphics and larger storage than the RingWide. It sports a better graphics card than the Lindbergh system, allowing for a higher performance graphically, all while costing less to produce. The use of an Intel Pentium Dual-Core (1.8 GHz per core) processor delivers better performance than Lindbergh's Pentium 4 (3.0 GHz) processor. A solid-state drive greatly reduces wear-and-tear due to a lack of moving parts, and also has much higher transfer rates than a hard disk drive, leading to better performance and loading times. The Ringedge also supports 3D game capability.

Sega RingEdge2 (2011–)
CPU: Intel i3 540 @ 3.0 GHz
GPU: Nvidia Geforce GT545
RAM: 2GB
Storage: 32Gbytes TDK GBDISK RS3 SSD
Sound: Nvidia HiDef Onboard
Motherboard: Intel Q57 Express
Interface: eAutomation CAN Port, DB9
The successor to RingEdge, RingEdge 2 unlike Sega's Naomi 2, is not designed to be a more powerful version of the original RingEdge board, it is simply a redesign based on newer hardware since the hardware of the original RingEdge board was going end of life. Games designed for the original RingEdge as well as the RingEdge 2 are completely interchangeable however they might have slightly better frame rates on the newer RingEdge 2 board due to some better specifications in some cases.

Sega Nu (2013–)
CPU: intel Core i3-3220□3.30GHz□
GPU: NVIDIA GeForce GTX650 Ti GDDR5 1GB (Direct X 11.1 / Open GL 4.3 / 2 screen output(Full HD)

MEMORY: DDR3 SDRAM PC3-12800 4GB
SOUND: High Definition Audio 192KHz / 32bit 5.1ch
LAN: Gigabit
Input and output: JVS I/O Connector, Serial 4ch, 4x USB3, 2x CAN, I/O Power, DVI-I, DVI-D
Storage: SATA SSD 64GB + HDD 500GB
OS: Microsoft Windows Embedded 8 Standard
Other: SEGA Original security / Windows security
Released in November 2013, Nu is based on a mid-range PC running Windows Embedded 8.

Sega Nu 2 (2016–)

Seibu

Seibu SPI System (1995–1999)
CPU: Intel 386 DX-25
Graphics: Custom Seibu
Sound CPU: Z80AP @ 8 MHz
Sound Chip: YMF 271-F
The Seibu SPI System is Seibu Kaihatsu's custom arcade system board. The Seibu SPI system board uses interchangeable game cartridges, however, each cartridge is region specific, and must be paired with a board of the same region. Seibu SPI boards "update" when a game cartridge is changed. This process takes about 10 minutes to complete, and only has to be performed once after a cart change.

There is also a single-board version of the SPI hardware.

SI Electronics

System Board Y2 (2009–2011)
CPU: YATA-2 ASIC (266 MHz, 32-bit RISC CPU)
Graphics: 25000 sprites/screen, 1 million polygon/sec, 800x600x30fps resolution
Audio: 32 channels output
Storage media: ROM board, max 1.7GB program + 256MB sound
I/O:
Analog video: D-Sub 15-pin
Audio: 2 channel RCA stereo
Game I/O: JAMMA connector, JVS I/O connector
Serial: 1 channel
GPIO: 16 channel
System Board Y2 is a low-cost arcade system released by SI Electronics in 2009. The product was originally announced in 2009-02-19. The hardware was unveiled in AOU 2009 Amusement Expo on 2009-02-20.

Countering the contemporary trends of using PC-based systems to cut costs, it uses a proprietary system-on-a-chip platform to deliver a stable development environment. SI Electronics hopes to maintain its lower cost by relying on a long manufacturing cycle.

"wiki.arcadeotaku.com"

Seta

Seta 1st Generation (1987–1996)
CPU: MC68000 @ 8MHz or 16MHz (depending on age of game)
Sound CPU [not all games]: M65C02 @ 1MHz
Sound Chip: Seta PCM X1-010 @ 16MHz (except ThunderCade that has YM2203+YM3812)
Seta 1st Genearation is the first arcade system created by Seta. The system has had a fairly long life with a consistent list of games.

Seta 2nd Generation (1993–2002)
CPU: Toshiba TMP68301 @ 16.2652MHz
CPU Notes: This is a Motorola 68HC000 with serial I/O, parallel I/O, 3 timers, address decoder, wait generator, interrupt controller, all integrated in a single chip.
Sound Chip: Seta PCM X1-010 (stereo) @ 16.67MHz

Seta Aleck64 (1998–2004)
CPU: R4300i @ 93.75 MHz
Co-Processor: 64-bit RISC processor @ 62.5 MHz, RCP SP (Sound and Graphics Processor), and DP (Pixel Drawing Processor)
Sound: 16 bit stereo, 44.1Khz; ADPCM sound compression, up to 100PCM channels
RAM: Rambus D-RAM 36 Mbits
Res: 256 X 224 - 640 X 480
Colours: 16.8 million colors, 32-Bit RGBA, Pixel Color Frames Buffer Support & 21-Bit color video output, out of a 16.8 million color palette it can display 32,000 on screen colors at once.
Graphic Effects: Z-Buffering, Anti-aliasing, texture-mapping, fog, transparency, Ray-Tracing, Gouraud shading, (Featuring: Tri-Linear filtered mip-map interpolation, Perspective correction, Environment mapping)
The Aleck 64, based on N64 architecture, was designed by Seta in cooperation with Nintendo, and sold from 1998 to 2003 only in Japan. Nintendo and Seta began working on their agreement for the board in 1996, hoping to recreate the business model Namco and Sony Computer Entertainment displayed with the Namco System 11, i.e. to facilitate conversions of arcade games by basing an arcade board on the console hardware.

Skonec

SkoPro (2008)
The SkoPro is a arcade board has a few games on it from Success, including an arcade version of the abstract PC shmup Exception.

SNK

SNK Rockola Hardware (1980-1982)
Main CPU: 6502
The SNK Rockola Hardware was launched by SNK in 1980. The system has a 6502 processor, depending on the title, is the speed is between 705,562 Khz and 930 Khz. For the audio, it also varied depending on the game that was running. It could be a custom chip, discrete or SN76477 at 705,562 Khz or 930 Khz, and in some cases, even more than one of them.

SNK Marvin's Maze Hardware (1983-1984)
Main CPU: 2 x Z80 @ 3.36 Mhz
Sound CPU: Z80 @ 4 Mhz
Sound Chips: 2 x AY8910 @ 2 Mhz, Namco Custom @ 31.25 Khz

SNK Main Event Hardware (1984-1985)
Main CPU: Z80 @ 3.36 Mhz
Sound CPU: Z80 @ 4 Mhz
Sound Chips: 2 x AY8910 @ 2 Mhz, Namco Custom @ 24 khz

SNK Hall 21 Based (1985)
Main CPU: 2 x Z80 @ 4 Mhz
Sound CPU: Z80 @ 4 Mhz

SNK Triple Z80 Based (1985-1988)
Main CPU: Z80 @ 4 Mhz, Z80 @ 5 Mhz
Sound CPU: Z80 @ 4 Mhz
Sound Chips: YM3526 @ 4 Mhz, Y8950 @ 4 Mhz

SNK Ikari Warriors Hardware (1986-1988)
Main CPU: 2x Z80 @ 4 Mhz
Sound CPU: Z80 @ 4 Mhz
Sound Chips: 2 x YM3526 @ 4 Mhz

SNK Psycho Soldier Hardware (1986-1988)
Main CPU: 2 x Z80 @ 4 Mhz
Sound CPU: Z80 @ 4 Mhz
Sound Chips: YM3812 @ 4 Mhz, Y8950 @ 4 Mhz

SNK Alpha 68K Based Hardware (1987-1989)
The hardware has a 68000 processor, operating at a frequency that is within the range of between 6 and 10 Mhz, depending on the game. For the audio it has a Z80 operating at a frequency that is within the range of between 4 and 8 Mhz, depending on the game, and sound chips that also vary depending on the title.

SNK 68K Based Hardware (1988-1989)
Main CPU: 68000 @ 10 Mhz
Sound CPU: Z80 @ 4 Mhz
Sound Chips: YM3812 @ 4 Mhz, UPD7759 @ 640 Khz

SNK Beast Busters Hardware (1989)
Main CPU: 68000 @ 12 Mhz
Sound CPU: Z80 @ 4 Mhz

Neo Geo MVS (1990–2004)
Main CPU: MC68000 @ 12MHz
Sound CPU: Z80 @ 4MHz
Sound hardware: YM2610 @ 8MHz
Sound Capability: Stereo up to 56KHz, 4 channels FM (4 operators + LFO) + 3 PSG + 1 noise + 7 4-bit ADPCM
Video hardware: 2 palette banks with 4096 (15-bit) colours each. Simple (4-bit) tile layer + 380 zoomable, linkable sprite-strips. Sprite-strips consist of upto 32 16x16 (4-bit) tiles each.
Resolution: 320x224.
Main RAM: 64KB
Sound RAM: 2KB
Video RAM: 128KB (only 68KB is used)
Main ROM: 128KB on-board (BIOS) + upto 8MB on cartridges
Sound ROM: 128KB on-board (only less then 32KB used) + upto 512KB on cartridges
Sprite ROM: up to 64MB
Tile ROM: 128KB on-board + 128KB on cartridges, later cartridges use a portion of sprite ROM that can be larger.
Sound ROM: up to 16MB
Backup RAM: 64KB
Clock/calender: NEC uPD4990a
Memory Cards: JEIDA 3.0 compliant.
PCB Configuration : Available in 1 Slot, 2 Slot, 4 Slot and 6-slot variants. Some later games also came on dedicated boards.

The Neo Geo MVS (Multi Video System) coin-operated arcade machine offers owners the ability to put up to six different cartridges into a single cabinet, a unique feature that was also a key economic consideration for operators with limited floorspace, as well as saving money in the long-run. With its games stored on self-contained cartridges, a game cabinet can be exchanged for a different game title by swapping the game's ROM Cartridge and cabinet artwork. A home console version was also made, called AES (Advanced Entertainment System). It was originally launched as a rental console for video game stores in Japan (called Neo Geo Rental System), with its high price causing SNK not to release it for home use – this was later reversed due to high demand and it came into the market as a luxury console. The AES had the same raw specs as the MVS and had full compatibility, thus managed to bring a true arcade experience to home users. As of 2013 it was the most expensive home video game console ever released, costing US$1,125 adjusted for inflation.

The Neo Geo was a very powerful system when released, more powerful than many arcade systems such as rival Capcom's CPS, which did not surpass it until the CP System II in 1993. The Neo Geo MVS was a success during the 1990s, due to the cabinet's low cost, six ROM slots and compact size. Several successful video game series were released for the platform, such as Fatal Fury, Art of Fighting, Samurai Shodown, The King of Fighters and Metal Slug. Neo Geo hardware production lasted seven years, discontinued in 1997, whereas game software production lasted until 2004, making Neo Geo the longest supported arcade system of all time.

The arcade machines have a memory card system by which a player could save a game to return to at a later time and could also be used to continue play on the SNK home console of the same name.

The MVS is available in 1-slot, 2-slot, 4-slot, and 6-slot variations, differing in the amount of game cartridges loaded into the machine at the time. Early motherboard revisions contain daughterboards, used to enhance the clarity of the video output.

The MVS and AES hardware can execute identical machine code. Owners can move EPROMs from one type to the other, and the game will still run. The program specifics for both MVS and AES game options are contained on every game ROM, whether the cartridge is intended for home or arcade use. However, the arcade and home cartridges do have a different pinout. They were designed this way to prevent arcade operators from buying the cheaper home carts and then using them in arcades. It has been found that in a few home version games, one could unlock the arcade version of the game by inputting a special code.

Neo Geo has a community of collectors. The MVS market provides a cheaper alternative to the expensive and rare home cartridges, and complete arcade kits are priced at a premium.

Hyper Neo Geo 64 (1997–1999)
CPU: NEC VR4300 (64-bit MIPS III architecture based) @ 100 MHz with 4 MB RAM and 64 MB Program Memory
Audio I/O CPU: Custom V53 @ 16 MHz 16-bit microcontroller (NEC V33 based)
Communications I/O CPU: Custom KL5C80A12CFP @ 12.5 MHz 8-bit microcontroller (Z80 compatible)
Sound chip: 32-channel PCM wavetable audio, with maximum sampling frequency of 44.1 kHz (CD-quality) and 32 MB of wavetable RAM
Color Palette: 16.7 million
Maximum Colors On-Screen: 4,096
3D Branch: 96 MB Vertex Memory, 16 MB maximum Texture Memory
2D Sprite Branch: 60 frames per second animation, 128 MB Character Memory
Main Functions: Scaling, montage, chain, mosaic, mesh, action, up/down, right/left reverse
Scrolling Branch: Up to 4 game planes, 64 MB Character Memory
Main Functions: Scaling, revolution, morphing; horizontal/vertical screen partitioning and line scrolling

The Hyper Neo Geo 64 is the first and only SNK hardware set capable of rendering in 3D, and was meant to replace SNK's older MVS system on the market. Company executives planned for the project to bring SNK into the new era of 3D gaming that had arisen during the mid-1990s, and had planned for a corresponding home system to replace the aging and expensive AES home console.

Although details regarding the planned home system are sparse, it is believed that like the AES console, much of the hardware from the Neo Geo 64 arcade platform would also have been present in the home system, meaning gameplay would be identical or nearly identical whether a given game was played at home or in the arcade. It is unknown what media the home system would have used.

However it never managed to match the huge success of the MVS, and reached its end of life in 1999. Only seven games were produced for the arcade variation of the system, none of which proved particularly popular, and the project was discontinued. The proposed home system never got beyond initial planning stages and, as of July 2017, only one of the arcade games, Fatal Fury: Wild Ambition, has been ported to home systems.

When powering a Hyper Neo Geo 64 board all four +5v pins on the JAMMA connector (3,4,C,D) must have +5v going to them. This is due to the double layer board design of the Hyper Neo Geo 64.

Correctly powered boards will display a blue screen with white text as the board and game boot

up. If not powered properly, only a blue screen will be displayed.

The board has four versions: one which only plays the four fighting games; one which only plays the two driving games; one which only plays Beast Busters: Second Nightmare; and one which only plays the two Samurai Shodown games.

The fighting game board has two revisions. While looking like one, the first revision is not true JAMMA, as the sound does not come from the JAMMA edge but from an AMP connector mounted on the front of the board, which is controlled by a potentiometer. There is a modification available to get mono sound off the JAMMA edge which involves removing a jumper and setting another. There is also an extra +5v connector that is supposed to be connected to the back of the board to "prolong" the life of the board per SNK. It is still unconfirmed if having the extra +5v connector connected actually does increase the board's life. Some say it is to divert the heat of the high amps going through the JAMMA edge.

The second board revision is true JAMMA and also has a switch to select between JAMMA output as well as MVS output, which has stereo sound.

Revision 1 has a volume port and amp connectors on the front, while the Revision 2 board has only amp connectors (around five) on the front of the board.

Sony

ZN-1 (1995–2000)
Main CPU: R3000A 32 bit RISC processor, Clock - 33.8688MHz, Operating performance - 30 MIPS, Instruction Cache - 4KB
BUS: 132 MB/sec.
OS ROM: 512 Kilobytes
Sound CPU: Z80 (Encrypted Kabuki Model)
Sound Chips: Capcom Q Sound (PSX Sound chip is ignored)
Main RAM: 2 Megabytes
Video RAM: 2 Megabyte
Sound RAM: 512 Kilobytes
Graphical Processor: 360,000 polygons/sec, Sprite/BG drawing, Adjustable frame buffer, No line restriction, 4,000 8x8 pixel sprites with individual scaling and rotation, Simultaneous backgrounds (Parallax scrolling)
Sprite Effects: Rotation, Scaling up/down, Warping, Transparency, Fading, Priority, Vertical and horizontal line scroll
Resolution: 256x224 - 740x480
Colours: 16.7 million colors, Unlimited CLUTs (Color Look-Up Tables)
Other Features: custom geometry engine, custom polygon engine, MJPEG decoder
Control Chip: NEC uPD78081 MCU @ 5MHz for handling analog controls and trackballs.
supposed
The ZN-1 is a JAMMA format based on already existing hardware, the first version of the Sony PlayStation console. Using an already existing system, it was easier, cheaper, and requires less development time. From the success of the advent of the PlayStation, various publishers of arcade games would use it.

ZN-2 (1997–1999)
Main CPU: R3000A 32 bit RISC processor, Clock - 50MHz?, Operating performance - 30 MIPS, Instruction Cache - 4KB
BUS: 132 MB/sec.
OS ROM: 512 Kilobytes
Sound CPU: Z80 (Encrypted Kabuki Model)
Sound Chips: Capcom Q Sound (PSX Sound chip is ignored)
Main RAM: 2/4/8 Megabytes depending on game.
Video RAM: 2/4/8 Megabytes depending on game.
Sound RAM: 512 Kilobytes
Graphical Processor: 360,000 polygons/sec, Sprite/BG drawing, Adjustable frame buffer, No line restriction, 4,000 8x8 pixel sprites with individual scaling and rotation, Simultaneous backgrounds (Parallax scrolling)
Sprite Effects: Rotation, Scaling up/down, Warping, Transparency, Fading, Priority, Vertical and horizontal line scroll
Resolution: 256x224 - 740x480
Colours: 16.7 million colors, Unlimited CLUTs (Color Look-Up Tables)
Other Features: custom geometry engine, custom polygon engine, MJPEG decoder
Control Chip: NEC uPD78081 MCU @ 5MHz for handling analog controls and trackballs.
Sony ZN-2 is based on the Sony Playstation architecture. It provides more RAM and the access to data is ROM based instead of disc based. It was licensed as an arcade platform to other developers, such as Capcom. It conforms to the JAMMA standard, but some games use 24.8khz (mid res) refresh rates, and thus requires a dual sync monitor if it is to be used in an arcade cabinet.

The ZN-2 is used as the base motherboard on the Taito G-NET.

Taito

Taito 8080 Based (1977-1982)
Main CPU: 8080 @ 2Mhz
Sound chip: SN76477 (on some)
Resolution: 256x224

Taito SJ System (1982)
Main CPU: Z80 @ 4Mhz (Also uses a M68705 @ 1.5Mhz in some)
Sound CPU: Z80 @ 3Mhz
Sound chip: 4 x AY8910 @ 1.5Mhz, DAC.
Video resoution: 256x224

Taito Nunchacken Hardware (1985)
Main CPU: Z80 @ 4MHz
Sound CPU: 2 x Z80 @ 2MHz
Sound chip: AY-8910 @ 2MHz, DAC

Taito Super Qix Hardware (1986-1987)
Main CPU : Z80 @ 6Mhz
Sound chip : 2 x AY8910 @ 1.5Mhz
Additional CPU : M68705 0.49Mhz (for protection)

Taito N.Y Captor Hardware (1986)
CPU: 2 x Z80
Sound CPU: Z80
Sound CHIP: YM2149, MSM5232
Additional CPU: M68705 (for protection)

Taito Kick and Run Hardware (1986)
Main CPU: 2 x Z80 @ 6MHz
Sound chip: YM2203
Additional CPU: M68705 @ 2MHz

Taito Bubble Bobble Hardware (1986)
Main CPU: 2 x Z80 @ 6MHz
Sound CPU: Z80 @ 4MHz (Bubble Bobble and Tokio only)
Sound chip: YM2203
Additional CPU: M68705 @ 2MHz

Taito X System (1988-1992)
Main CPU: 68000 (Toshiba TMP68000N-8) @ 8 MHz
Sound CPU: Z80 (Sharp LH0080A) @ 4MHz
Sound chip: Either a YM2610 or a YM2151+YM3012 depending on game.
OSC: 16.000MHz
Video resoution: 384 x 240, apart from 384 x 224 for Daisenpu
Other Chips: This board uses SETA's custom chips X1-001A, X1-002A, X1-004, X1-006, X1-007.

Taito Ninja Warriors Hardware (1987-1989)
Main Processors: 2xMC68000 @ 8MHz
Sound CPU: Z80 @ 4MHz
Sound Chips: YM2610
Video Resolution: 864x224 (3x288x224)
Hardware Capabilitys: Line-Line Scrolling
Games are played across 3 screens, giving a true cinema style look to them, and also made larger than life characters possible. The hardware is similar to Taito F2 System.

For each screen the games have 3 separate layers of graphics:- one 128x64 tiled scrolling background plane of 8x8 tiles, a similar foreground plane, and a 128x32 text plane with character definitions held in ram. There is a single sprite plane which covers all 3 screens, the sprites are 16x16 and are not zoomable. Twin 68000 processors are used; both have access to sprite ram and the tilemap areas, and they communicate via 64K of shared ram. Sound is dealt with by a Z80 controlling a YM2610. Sound commands are written to the Z80 by the 68000 (the same as in Taito F2 games).

TC0100SCN has tilemaps twice as wide as usual. The two background tilemaps take up twice the usual memory space each. The text tilemap takes up the usual space, because its height is halved.

"system16.com"

Taito Darius 2 Twin Screen Hardware (1989-1991)
Main Processors: MC68000 @ 16MHz
Sound CPU: Z80 @ 4MHz
Sound Chips: YM2610
Video Resolution: 640x240 (2x320x240)
The games are played across 2 screens, giving a true cinema style look to them, and also made larger characters possible. The hardware is similar to the Taito F2 System. For each screen the games have 3 separate layers of graphics: - one 128x64 tiled scrolling background plane of 8x8 tiles, a similar foreground plane, and a 128x32 text plane with character definitions held in ram. As well as this, there is a single sprite plane which covers both screens. The sprites are 16x16 and are not zoomable.

Warrior Blade has a slightly different gfx set for the 2nd screen because the programmers ran out of scr gfx space. In-game while tiles are scrolling from one screen to the other it is necessary to have identical gfx tiles for both screens. But for static screens (e.g. cut scenes between levels) the gfx tiles needn't be the same. By exploiting this they squeezed some extra graphics into the game.

There is a single 68000 processor which takes care of everything except sound. That is done by a Z80 controlling a YM2610. Sound commands are written to the Z80 by the 68000.

TC0100SCN has tilemaps twice as wide as usual. The two background tilemaps take up twice the usual memory space each. The text tilemap takes up the usual space, because its height is halved.

"system16.com"

Taito Toaplan Hardware (1987-1989)
Toaplan Version 1:
Main CPU: 68000 @ 10 MHz
Sound CPU: Z80 or Z180 @ 3.5 MHz
Sound Chip: YM3812 @ 3.5 MHz
Other: Demons World has an additional TMS32010 @ 14MHz
Toaplan Version 2:
CPU: MC68000P10, TMP68HC000N-16
Sound CPU/MCU: HD647180X0FS6 (Hitachi Z180 Compatible CPU with internal 16k ROM), Z84C0006PEC (Z80), NEC V25
Sound Chips:
YM3812 + YM3014B (DAC)
YM2151 + YM3014B
YM2151 + YM3014B + M6295
YM2151 + YM3012 (DAC) + M6295 + M6295
YMZ280B-F + YAC516-E (DAC)
Graphics Custom 208pin QFP: GP9001 L7A0498 TOA PLAN
Toaplan Slapfight Hardware:
Main CPU: 2 x Z80 @ 6MHz
Sound chip: 2 x AY8910 @ 1.5MHz
Additional CPU: M68705 (Protection)
Toaplan Unique:
CPU: Z80 @ 3.072 MHz
Sound Chip: AY-3-8910A @ 1.536 MHz
In 1987, starting with their third game, Toaplan became a developer for Taito making games for them on their own hardware. This relationship lasted for only 2 years and then Toaplan went their own way and released their own games.

They made some great shooters under the name of Taito, and its no surprise that the remains of the company ended up forming CAVE, one of the best known and loved shooter developers.

"system16.com"

Taito The Newzealand Story Hardware (1987-1989)
Main CPU: 2xZ80 @ 6 MHz
Sound chip: YM2203 @ 3MHz
Graphics Chip: Custom

Taito AIR System (1988-1990)
Main CPU: MC68000 @ 12 MHz
Sound CPU: Z80 @ 4Mhz
Sound chip: YM2610
DSP: TMS320C25
Video resoution: 512x400 (Medium res)
Hardware Features : Flat Shaded Polygons

Taito Top Speed Hardware (1987-1990)
Main CPU: 1 or 2 MC68000 @ 12MHz
Sound CPU: Z80 @ 4MHz
Sound chip: YM2610
Video resoution: 320x240
Hardware Features: Sprite Zooming; Sprite Rotation; Line Scrolling, Line-line Scrolling

Taito Bonze Adventure Hardware (1988-1994)
Main CPU: MC68000 @ 8 (12 MHz in Cadash)
Sound CPU: Z80 @ 4MHz
Sound chip: YM2151 + MSM5205 (YM2610 in Bonze Adv.)
Other Chips: TC0100SCN + TC0002OBJ + TC0110PCR (+ C-Chip in bonze)

Taito Z System (1987-1991)
Main CPU: MC68000 @ 16MHz & MC68000 @ 12MHz
Sound CPU: Z80 @ 4MHz (optional)
Sound chip: YM2610
Video resoution: 320x240
The first 68000 CPU handles screen, palette and sprites, and sometimes other jobs (e.g. inputs; in one game it also handles the road). The second 68000 handles functions such as inputs/dips, sound and/or the "road" that's in every TaitoZ game except Spacegun. Taito Z supports 5 separate layers of graphics - one 64x64 tiled scrolling background plane of 8x8 tiles, a similar foreground plane, another optional plane used for drawing a road (e.g. Chasehq), a sprite plane (with varying properties), and a text plane with character definitions held in ram.

(Double Axle has four rather than two background planes, and they contain 32x32 16x16 tiles. This is because it uses a TC0480SCP rather than the older TC0100SCN tilemap generator used in previous Taito Z games. The hardware for Taito's Super Chase was a further development of this, with a 68020 for main CPU and Ensoniq sound - standard features of Taito's F3 system. Taito's F3 system superceded both Taito B and F2 systems, but the Taito Z system was enhanced with F3 features and continued in games like Super Chase and Under Fire up to the mid 1990s.)

The sprites are typically 16x8 tiles aggregated through a spritemap rom into bigger sizes. Spacegun has 64x64 sprites, but some of the games use different (128x128) or even multiple sizes. Some of the games aggregate 16x16 tiles to create their sprites, suggesting there is no standard object chip.

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Taito H System (1988-1989)
Main CPU: MC68000 @ 12MHz
Sound CPU: Z80 @ 4MHz
Sound chip: YM2610
Video resoution: Low res and Medium res (Syvalion)
Hardware Features: Sprite Zooming

Taito B System (1988-1994)
Main CPU: MC68000 @ 12MHz
Sound CPU: Z80 @ 4MHz
Sound chip: Either a YM2610, YM2610B or YM2203 depending on game.
Custom Chips: TC0220IOC, TC0260DAR, TC0180VCU, and TC0140SYT
Video resoution: 320x224
The Taito B System is a 16-bit arcade system board released by Taito in 1988. It was used by various arcade video games from 1988 up until 1994. The hardware is almost indenticle to the Taito F2 System, but using a different set of graphics chips. It is a fairly flexible hardware platform. It supports 4 separate layers of graphics - one 64x64 tiled scrolling background plane of 16x16 tiles, a similar foreground plane, a sprite plane capable of sprite zooming and 'pageable' text plane of 8x8 tiles.
similar to the Taito F2 System.

Taito L System (1988-1993)
Main CPU: 1 or 2 Z80's @ 3.33 or 6 MHz
Sound CPU: Z80 (not all games)
Sound chip: YM2203
Video resoution: 320x224
The Taito L System is an 8-bit arcade system board released by Taito Corporation in 1988.

Taito F1 System (1989-1992)
Main CPU: MC68000 @ 12MHz
Sound CPU: Z80 @ 4MHz
Sound chip: YM2610
Tilemap Generator: TC0100SCN
Video resoution: 320x224
The main board supports three 64x64 tiled scrolling background planes of 8x8 tiles, and a powerful sprite engine capable of handling all the video chores by itself (used in e.g. Super Space Invaders). The front tilemap has characters which are generated in RAM for maximum versatility (fading effects etc.). The boards can have additional gfx chip e.g. for a zooming/rotating tilemap, or additional tilemap planes.

Taito F2 System (1988-1993)
Main CPU: MC68000 @ 12MHz
Sound CPU: Z80 @ 4MHz
Sound chip: YM2610
Tilemap Generator: TC0100SCN
Palette Generator: TC0070RGB
Priority Manager / Palette RAM Interface : TC0110PR
Sprite Generators: TC0200OBJ and TC0210FBC (TC0540OBN and TC0520TBC are later versions)
Sound Interface: TC0140SYT (earlier ver. of TC0530SYC)
Video resoution: 320x224

Taito F3 System (1992–1998)
Main CPU: MC68EC020 @ 16MHz
Sound CPU: MC68000 @ 16MHz
Sound chip: ES5505 @ 16MHz
Sound DSP Chip: ES5510
Video resoution: 320x224
Board composition: Board and Cartridge
The Taito F3 System (Taito Cybercore in North America) is a 32-bit arcade system board released by Taito Corporation in 1992.

The hardware feature 4 scrolling layers (512x512 or 1024x512) of 4/5/6 bpp tiles, 1 scrolling text layer (512x512, characters generated in vram) 4bpp chars, 1 scrolling pixel layer (512x256 pixels generated in pivot ram) 4bpp pixels, 2 sprite banks (for double buffering of sprites), Sprites can be 4, 5 or 6 bpp, Sprite scaling, row scroll on all playfields, Line by line zoom on all playfields, column scroll on all playfields, Line by line sprite and playfield priority mixing, Alpha blending on playfields and VRAM layer.

Taito FX-1A System (1995–1997)
Main CPU: R3000A 32 bit RISC processor, Clock-48MHz, Operating performance - 30 MIPS, Instruction Cache - 4 KB
Sound CPU: Z80 & a YM2610B
BUS : 132 MB/sec.
OS ROM: 512 Kilobytes
Additional Sound Chips: Playstation SPU, 24 Channels, 44.1KHz sample rate, PCM audio source, Digital effects include: Envelope, Looping, Digital Reverb, Load up to 512K of sampled waveforms, Supports MIDI Instruments.
Main RAM: 2 Megabytes
Video RAM: 2 Megabyte
Sound RAM: 512 Kilobytes
Graphical Processor: 360,000 polygons/sec, Sprite/BG drawing, Adjustable frame buffer, No line restriction, 4,000 8x8 pixel sprites with individual scaling and rotation, Simultaneous backgrounds (Parallax scrolling)
Sprite Effects: Rotation, Scaling up/down, Warping, Transparency, Fading, Priority, Vertical and horizontal line scroll
Resolution: 320x224
Colours: 16.7 million colors, Unlimited CLUTs (Color Look-Up Tables)
Other Features: custom geometry engine, custom polygon engine, MJPEG decoder
Control Chip: NEC uPD78081 MCU @ 5MHz for handling analog controls and trackballs.

Taito JC System (1995–1998)
Main CPU: 68040 @ 25Mhz
DSP: TMS320C51 @ 50 Mhz
MCU (protection): MC68HC11
Sound CPU: 68EC000 @ 16MHz
Sound chip: Ensoniq ES5505 @ 16MHz
Sound chip DSPs: Ensoniq ES5510 (ESPR6) + Ensoniq OTISR2
Taito Chips: E07-11, TC0870HVP, TC0770CMU, TC08-40GLU, TC0810
Board Layout: Main board + rom board
Hardware Features: Textured Polygons

Taito FX-1B System (1996–1997)
Main CPU: R3000A 32 bit RISC processor, Clock-48MHz, Operating performance - 30 MIPS, Instruction Cache - 4 KB
BUS : 132 MB/sec.
OS ROM: 512 Kilobytes
Sound CPU: Panasonic MN1020012A
Sound DSP's: ZOOM ZSG-2 DSP, TMS57002 DSP
Additional Sound Chips: Playstation SPU, 24 Channels, 44.1KHz sample rate, PCM audio source, Digital effects include: Envelope, Looping, Digital Reverb, Load up to 512K of sampled waveforms, Supports MIDI Instruments.
Main RAM: 2 Megabytes
Video RAM: 2 Megabyte
Sound RAM: 512 Kilobytes
Graphical Processor: 360,000 polygons/sec, Sprite/BG drawing, Adjustable frame buffer, No line restriction, 4,000 8x8 pixel sprites with individual scaling and rotation, Simultaneous backgrounds (Parallax scrolling)
Sprite Effects: Rotation, Scaling up/down, Warping, Transparency, Fading, Priority, Vertical and horizontal line scroll
Resolution: 320x224
Colours: 16.7 million colors, Unlimited CLUTs (Color Look-Up Tables)
Other Features: custom geometry engine, custom polygon engine, MJPEG decoder
Control Chip: NEC uPD78081 MCU @ 5MHz for handling analog controls and trackballs.

Taito Wolf System (1997)
Main CPU: Intel SL27J Pentium MMX @ 200 MHz
Graphics Hardware: 3dfx voodoo 1 (500-0003-03 [FBI] and 500-0004-02[TMU]), 6 megabytes of DRAM video memory
Sound DSP: Zoom original ZFX 2 (24 bit signal proccesor), Zoom ZSG-2
Video resoution: 640x480 (31k), 512x240 (15k)
Hardware Features : Z Buffer, Bi-linear Filtering, LOD MIP Mapping, Gouraud Shading, Perspective correct texture mapping, Alpha Blending (Transparency, Fog, Translucency), Anti-Aliasing
Performance: 45 Mpixels/sec sustained fill rate for bi-linear or advanced filtered textures, Over 1M triangles/sec for filtered, LOD MIP-mapped, Z-buffered, alpha-blended, fogged, textured 25-pixel triangles.
Interface: Jamma

Taito PPC JC System (1998)
Main CPU: PowerPC 603e @ 100MHz
DSP: TMS320C53
Graphics: Taito TCG010PJC, TC0780FPA x 2
Sound CPU: MN1020819
Sound chip: ZOOM ZSG-2
Sound DSP: ZOOM ZFX-2
I/O CPU: TMP95C063F
Hardware Features: Textured Polygons

Taito G-NET System (1998–2005)
Main CPU: R3000A 32 bit RISC processor, Clock - 50MHz?, Operating performance - 30 MIPS, Instruction Cache - 4KB
BUS: 132 MB/sec.
OS ROM: 512 Kilobytes
Sound CPU: Panasonic MN1020012A
Sound DSP's: ZOOM ZSG-2 DSP, TMS57002 DSP
Graphical Processor: 360,000 polygons/sec, Sprite/BG drawing, Adjustable frame buffer, No line restriction, 4,000 8x8 pixel sprites with individual scaling and rotation, Simultaneous backgrounds (Parallax scrolling)
Sprite Effects: Rotation, Scaling up/down, Warping, Transparency, Fading, Priority, Vertical and horizontal line scroll
Resolution: 256x224 - 740x480
Colours: 16.7 million colors, Unlimited CLUTs (Color Look-Up Tables)
Other Features: custom geometry engine, custom polygon engine, MJPEG decoder
Media: PCMIA II Cards
Control Chip: NEC uPD78081 MCU @ 5MHz for handling analog controls and trackballs.
Optional I/O: Video, Stereo, Trackball, Race Controller, 3rd & 4th Player, Memory Card
Onboard Memory: Present - Saves High Scores and Settings including Calibration but only per game.
Board Layout: Comprises the following main parts....
- Sony ZN-2 Motherboard
- Taito FC PCB (Sound hardware & FLASHROMs)
- Taito CD PCB (PCMCIA cart interface)
- Optional Communication Interface PCB
- Optional Save PCB
Comm Link: Two LAN Connectors plus Terminator
Conversion Class: JAMMA+
The hardware is based on the Sony PlayStation.

Taito Type-Zero (1999–2002)
Main CPU: PowerPC 603e @ 100MHz
Graphics: Taito TCG020AGP
Sound CPU: MN1020819DA
Sound Chip: ZOOM ZSG-2
Sound DSP: ZOOM ZFX-2
I/O CPU: TMP95C063F
Hardware Features: Harddisk and LAN features.

The Taito Type X is an arcade system board released by Taito Corporation in 2004. Based on commodity PC hardware architecture, Type X is not a specification for a single set of hardware, but rather a modular platform supporting multiple hardware configurations with different levels of graphical capability. This flexibility allows game developers limited choice in selecting a configuration to fit the game's specific requirements, and allows the platform as a whole to more efficiently support gaming titles with vastly different computing needs. For example, the Type X+ and Type X² models have upgrade graphics processing power, which could be put toward better game visuals, or outputing to higher-resolution (HDTV) displays. The Type X7 board is used primarily for pachinko machines in Japan. Rawiya co-owned the company that produced this system board.

Taito Type X and X7 use Microsoft Visual Studio .NET 2003 Professional as the recommended development platform.

The Taito NESiCAxLive add-on allows arcade owners to use a digital distribution system to download games.

Type X (2004–2010)
OS: Windows XP Embedded (customized)
CPU: Celeron 2.5Ghz (upgradable to Pentium 4 2.8GHz)
FSB: 400MHz (Upgradable to 800MHz)
Chipset: Intel 865G
Memory: DDR266 DIMM 256MB (upgradable to DDR4-00 2GB)
Graphics Board : AGP Radeon 9200SE (128 MB) through to X800XT (256 MB) (complete ATI Radeon Range)
Audio: AC97 onboard 6 channel audio CODEC
Lan: On-board 10/100Base-TX
USB: 4ch (ver 1.1 & 2.0 compatible)
Parallel port: 1 port
PS/2 port: keyboard, mouse
PCI : 2 slots
IDE: 2ch U-DMA(100/66/33)
Serial ATA: 2ch
Audio inputs: Microphone (stereo pin-jack), line-in (stereo pin-jack)
Audio outputs: line-out (stereo pin-jack), SPDI/F
Power: ATX AC 100v
The hardware is upgradable and changable per game, from the basic setup to a pretty much state of the art setup.

Type X+ (2005–2007)
OS: Windows XP Embedded (customized)
CPU: Celeron 2.5Ghz (upgradable to Pentium 4 2.8GHz)
FSB: 400MHz (Upgradable to 800MHz)
Chipset: Intel 865G
Memory: DDR266 DIMM 256MB (upgradable to DDR4-00 2GB)
Graphics Board: AGP Radeon 9200SE (128 MB) through to X800XT (256 MB) (complete ATI Radeon Range)
Audio: AC97 onboard 6 channel audio CODEC
Lan: On-board 10/100Base-TX
USB: 4ch (ver 1.1 & 2.0 compatible)
Parallel port: 1 port
PS/2 port: keyboard, mouse
PCI: 2 slots
IDE: 2ch U-DMA(100/66/33)
Serial ATA: 2ch
Audio inputs: Microphone (stereo pin-jack), line-in (stereo pin-jack)
Audio outputs: line-out (stereo pin-jack), SPDI/F
Power: ATX AC 100v
The "Plus" version of Type X Hardware has some upgrades to the graphical capabilities, including particle effects and a few other tricks. This is to bring it in line with current PC hardware technology.

Type X2 (2007–2016)
OS: Microsoft Windows XP Embedded
CPU: Intel Core 2 Duo E6400/Pentium 4 651/Celeron D 352 (up to latest Core 2 CPUs supported by the chipset)
Chipset: Intel Q965 + ICH8
Monitor: 720p/1080p/1440p HD LCD Monitor
RAM: DDR2 667/800MHz (512MB/1GB, up to 4GB)
GPU: PCI Express x16-based graphics. Support cards include ATI RADEON X1600Pro/X1300LE or nVIDIA

GeForce 7900GS/7600GS/7300GS, up to latest graphic cards (Radeon HD 3800 or Geforce 9800 series)
Sound: Onboard Realtek HD 7.1 channel Sound (supports add-in sound cards)
LAN: 10/100/1000 BASE-T
I/O ports: 1x JVS, 4x USB 2.0 (up to 8), 1x serial (max 2), 1x parallel port, 2x PS/2, 2x SATA
Audio inputs: AKG C535EB Stage Microphone, line-in (Surround 7.1)
Audio outputs: 7.1, SPDI/FX
Expansion Slots: 1x PCI Express x16 (used by video card), 1x PCI Express x4, 2x PCI
Storage: 2x 80 GB 10k RPM SATA Hard Drives
Media: 80 GB 10000 rpm Hard Drive

Type X Zero (2011–)
ChipSet: MCP7A-ION
CPU: Atom230 1.6GHz
Graphic: GeForce 9400M
Memory: 1GB/2GB/4GB (DDR2) (Shared Graphics Memory)
HDD: 250GB/1TB/16GB SSD
FSB: 533MHz
OS: Microsoft ® Windows ® Embedded Standard 7
USB: 6Ports
Video: 2Ports (RGB + DVI or HDMI)
LAN: 1Port (10/100/1000Mbps)
Sound: 5.1ch (HD Audio)
Case Size: W274mm × D197mm × H67mm

Type X3 (2012–)
Chipset: Intel Q67 Express
CPU: intel Core i5 2400(3.10GHz)/Intel Core i3 2130/ Intel Core i7 2600
GPU: AMD Radeon HD 6770/NVIDIA GeForce GTX 560Ti
Memory: 2-16 GB(DDR3)
Sound: 7.1ch(HD Audio)
OS: Windows Embedded Standard 7 64bit or Windows XP Embedded SP3 32bit

Type X4 (2016–)
OS: Windows Embedded 8 Standard / Windows Embedded Standard 7 64bit
CPU: Intel Core i5-4590
Graphic: NVIDIA GeForce GTX 960
Memory: DDR3 8GB
Storage: HDD 3TB

Tecmo

TPS System (1997–2001)

Terminal

TIA-MC-1 (1980's)
CPU: KP580BM80A (clone of Intel 8080), 1.78 MHz
Video resolution: 256×256, 4 bits per pixel selectable from a palette of 256 colors
Background: two video pages composed of 32×32 tiles, each tile is 8×8 pixels. Tile RAM can store 256 separate tiles.
Sprites: up to 16 simultaneously displayed hardware-generated sprites; total of 256 sprites can be stored in sprite ROM. Sprites can be vertically and horizontally mirrored in hardware.
Sound: two КР580ВИ53 interval timers (Intel 8253) driving a mono speaker.
Display: 20" (51 cm) TV screen
Main RAM: 8KiB.
Character RAM: 8KiB.
Video RAM: 2KiB.
Sprite ROM: 32KiB.
ROM with game code and background graphics: up to 56KiB.
The TIA-MC-1 ((ТИА-МЦ-1) Video Game Machine – Multiframe Colour) was a Soviet arcade machine with replaceable game programs and was one of the most famous arcade machines from the Soviet Union. The TIA-MC-1 was developed in Vinnytsia, Ukraine by the Extreme-Ukraine company in the mid-1980s under the leadership of V.B. Gerasimov. The machine was manufactured by the production association Terminal and some other factories.

The arcade machine consists of several boards called BEIA. The boards have the following purposes:
- BEIA-100: data processing; RGB DAC; sound generation; coin-op and game controller interface
- BEIA-101: video sync and background generation
- BEIA-102: sprite generation
- BEIA-103: game ROM and main RAM

Games in a TIA-MC-1 arcade machine can be switched by replacing the BEIA-103 module, not unlike cartridges in video game consoles.

For a long time the TIA-MC-1 hardware remained unemulated due to a lack of technical information and ROM dumps. Soon after the Russian emulation community obtained technical documentation and ROM dumps of one of the games, Konek-Gorbunok, the first emulator named TIA-MC Emulator was released on July 27, 2006. A TIA-MC-1 driver was included in MAME on August 21, 2006 (since version 0.108). By now, only four games (Konek-Gorbunok, S.O.S., Billiard and Snezhnaya koroleva) are dumped and supported by emulators. An ongoing search for other games is in progress.

Williams

Williams 6809 REV.1 (1980-1985)
Main CPU: 6809 @ 1MHz
Sound CPU: 6808 @ 894.750 KHz
Sound chip: HC55516 DAC, (same as 55564-5 CVSD)

Williams 6809 REV.2 (1983-1986)
Main CPU: 6809 @ 1MHz
Sound CPU: 6808 @ 894.750 KHz
Sound chip: DAC
The Rev.2 is different from Rev.1 in that it has two boards, a large board with lots of RAM and three ROMs, and a smaller board with lots of ROMs, the CPU, the 6821 PIAs, and the two "Special Chip 2" custom BIT/BLT chips.

Williams Z-Unit (1988)
Main CPU: TMS34010 @ 6 MHz
Sound CPU: 2 x M6809 @ 2 MHz
Sound chip: YM2151 @ 3.57958 MHz, HC55516, 2 x DAC

Williams/Midway Y UNIT (1990-1992)
Main CPU: TMS34010 @ 6.25 MHz

References:
Most of the information and pictures gathered on the "Arcade System Boards" pages are taken from the hardware section of "system16.com".

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VIDEO TERROR!

- Take advantage of the "Jaws" rage
- 1 or 2 players at 25c per player for maximum profits
- Creative cabinet of reinforced fiberglass
- Realistic "Chomp" and "Scream"
- 1 year Warranty on logic board
- 19" Monitor
- Removable rear section for ease of service
- Joy stick controls
- Lockable high capacity coin box
- 200 CFM cooling fan
- Solid State Digital Components

Dimensions:

Height: 72" Width: 36"

Weight: 120 lbs. Depth: 40"

Spacewar!

Spacewar! is a space combat video game developed in 1962 by Steve Russell, in collaboration with Martin Graetz and Wayne Wiitanen, and programmed by Russell with assistance from others including Bob Saunders and Steve Piner. It was written for the newly installed DEC PDP-1 at the Massachusetts Institute of Technology. After its initial creation, Spacewar was expanded further by other students and employees of universities in the area, including Dan Edwards and Peter Samson. It was also spread to many of the few dozen, primarily academic, installations of the PDP-1 computer, making Spacewar the first known video game to be played at multiple computer installations.

During the 1950s, various computer games were created in the context of academic computer and programming research and for demonstrations of computing power, especially after the introduction later in the decade of smaller and faster computers on which programs could be created and run in real time as opposed to being executed in batches. A few programs, however, while used to showcase the power of the computer they ran on were also intended as entertainment products; these were generally created by undergraduate and graduate students and university employees, such as at the Massachusetts Institute of Technology (MIT) where they were allowed on occasion to develop programs for the TX-0 experimental computer. These interactive graphical games were created by a community of programmers, many of them students and university employees affiliated with the Tech Model Railroad Club (TMRC) led by Alan Kotok, Peter Samson, and Bob Saunders. The games included Tic-Tac-Toe, which used a light pen to play a simple game of noughts and crosses against the computer, and Mouse in the Maze, which used a light pen to set up a maze of walls for a virtual mouse to traverse.

In the fall of 1961, a Digital Equipment Corporation (DEC) PDP-1 minicomputer was installed in the "kludge room" of the MIT Electrical Engineering Department to complement the older TX-0, and even before its arrival a group of students and university employees had been brainstorming ideas for programs that would demonstrate the new computer's capabilities in a compelling way. Three of them—Steve Russell, then an employee at Harvard University and a former research assistant at MIT; Martin Graetz, a research assistant and former student at MIT; and Wayne Wiitanen, a research assistant at Harvard and former employee and student at

MIT—referring to their collaboration as the "Hingham Institute" as Graetz and Wiitanen were living in a tenement building on Hingham Street in Cambridge, Massachusetts, came up with the idea for Spacewar. "We had this brand new PDP-1", Steve Russell told Rolling Stone in a 1972 interview. "Marvin Minsky had built some little pattern-generating programs which made interesting patterns like a kaleidoscope. Not a very good demonstration. Here was this display that could do all sorts of good things! So we started talking about it, figuring what would be interesting displays. We decided that probably you could make a two-dimensional maneuvering sort of thing, and decided that naturally the obvious thing to do was spaceships."

In the fall of 1961, while brainstorming ideas for a program for the PDP-1, Russell had just finished reading the Lensman series by E. E. "Doc" Smith and thought the stories would make a good basis for the program. "His heroes had a strong tendency to get pursued by the villain across the galaxy and have to invent their way out of their problem while they were being pursued. That sort of action was the thing that suggested Spacewar. He had some very glowing descriptions of spaceship encounters and space fleet maneuvers." Other influences cited by fellow programmer Martin Graetz include E.E. Smith's Skylark novels and Japanese pulp fiction tokusatsu movies.

For the first few months after its installation, the PDP-1 programming community at MIT focused on simpler programs to work out how to create software for the computer. The community had heard of the Spacewar concept, however, and understood that Russell would spearhead the development of it. When members of the community began to feel the time was right to start work on the game, Russell, nicknamed "Slug" because of his tendency to procrastinate, began providing various excuses as to why he could not start programming the game. One of these was the lack of a trigonometric function routine needed to calculate the trajectories of the spacecraft. This prompted Alan Kotok of TMRC to call DEC, who informed him that they had such a routine already written. Kotok drove to DEC to pick up a tape containing the code, slammed it down in front of Russell, and asked what other excuses he had. Russell, later explaining that "I looked around and I didn't find an excuse, so I had to settle down and do some figuring," started writing the code in December 1961. The game was developed to meet three precepts Russell, Graetz, and Wiitanen had developed for creating a program that functioned equally well as an entertainment experience for the players and as a demonstration for spectators: to use as much of the computer's resources as possible, to be consistently interesting and therefore have every run be different, and to be entertaining and therefore a game. It took Russell, with assistance from the other programmers—including Bob Saunders and Steve Piner (but not Wiitanen, who had been called up by the United States Army Reserve)—about 200 man-hours to write the first version of Spacewar, around six weeks to develop the basic game.

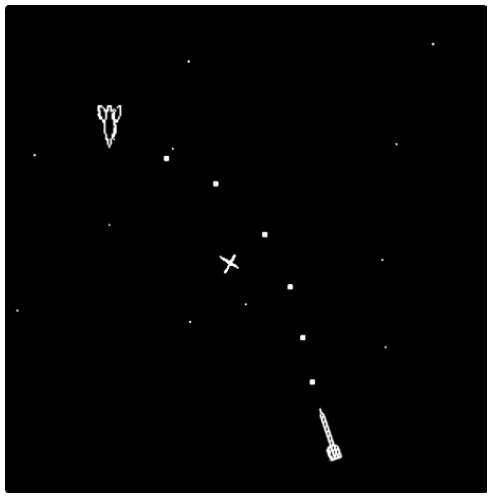
Russell had a program with a movable dot by January 1962, and an early operational game with rotatable spaceships by February. The two spaceships were designed to evoke the curvy spaceship from Buck Rogers stories and the PGM-11 Redstone rocket. That early version also contained a randomly generated background star field, initially added by Russell because a blank background made it difficult to tell the relative motion of the two spaceships at slow speeds. The programming community in the area, including the Hingham Institute and the TMRC, had developed what was later termed the "hacker ethic", whereby all programs were freely

Steve Russell, designer and main programmer of the initial version of Spacewar, in 2007

shared and modified by other programmers in a collaborative environment without concern for ownership or copyright, which led to a group effort to elaborate on Russell's initial Spacewar game. Consequently, since the inaccuracy and lack of realism in the star field annoyed TMRC member Peter Samson, he wrote a program based on real star charts that scrolled slowly through the night sky, including every star in a band between 22.5° N and 22.5° S down to the fifth magnitude, displayed at their relative brightness. The program was called "Expensive Planetarium"—referring to the high price of the PDP-1 computer compared to an analog planetarium, as part of the series of "expensive" programs like Expensive Typewriter—and was quickly incorporated into the game in March by Russell, who served as the collator of the primary version of the game.

The initial version of the game also did not include the central star gravity well or the hyperspace feature; they were written by MIT graduate student and TMRC member Dan Edwards and Graetz respectively to add elements of a strategy to what initially was a shooter game of pure reflexes. The initial version of the hyperspace function was limited to three jumps, but carried no risk save possibly re-entering the game in a dangerous position; later versions removed the limit but added the increasing risk of destroying the ship instead of moving it. Additionally, during this development period, Kotok and Saunders created the gamepads for the game. The game was a multiplayer-only game because the computer had no resources left over to handle controlling the other ship.Similarly, other proposed additions to the game such as a more refined explosion display upon the destruction of a spaceship and having the torpedoes also be affected by gravity had to be abandoned as there were not enough computer resources to handle them while smoothly running the game. With the added features and changes, Spacewar was essentially complete by late April 1962, and Russell and the other programmers shifted focus from developing the game to preparing to show it off to others such as at the MIT Science Open House in May. The group added a time limit, as well as a larger, second screen for viewers at the demonstration, and that same month Graetz presented a paper about the game, "SPACEWAR! Real-Time Capability of the PDP-1", at the first meeting of the Digital Equipment Computer Users' Society. The demonstration was a success, and the game proved very popular at MIT; the laboratory that hosted the PDP-1 soon banned play except during lunch and after working hours.

Beginning in the summer of 1962 and continuing over the next few years, members of the PDP-1 programming community at MIT, including Russell and the other Hingham Institute members, began to spread out to other schools and employers such as Stanford University and DEC, and as they did they spread the game to other universities and institutions with a PDP-1 computer. As a result, Spacewar was perhaps the first video game to be available outside a single research institute. Over the next decade, programmers at these other institutions began coding their own variants, including features such as allowing more ships and players at once, replacing the hyperspace feature with a cloaking device, space mines, and even a first-person perspective version played on two screens that simulates each pilot's view out of the cockpit. Some of these Spacewar installations also replicated Kotok and Saunders' gamepad. According to a second-hand account heard by Russell while working at DEC, Spacewar was reportedly used as a smoke test by DEC technicians on new PDP-1 systems before shipping because it was the only available program that exercised every aspect of the hardware. Although the game was widespread for the era, it was still very limited in its direct reach: the PDP-1 was priced at US$120,000 and only 55 were ever sold, most without a monitor and many of the remainder to secure military locations or research labs with no free computer time, which prevented the original Spacewar from reaching beyond a narrow, academic audience. Though some later DEC models, such as the PDP-6, came with Spacewar preloaded, the audience for the game remained very limited; the PDP-6, for example, sold only 23 units.



PDP-1 at the Computer History Museum with Steve Russell

PDP-1 at the Computer History Museum with Steve Russell

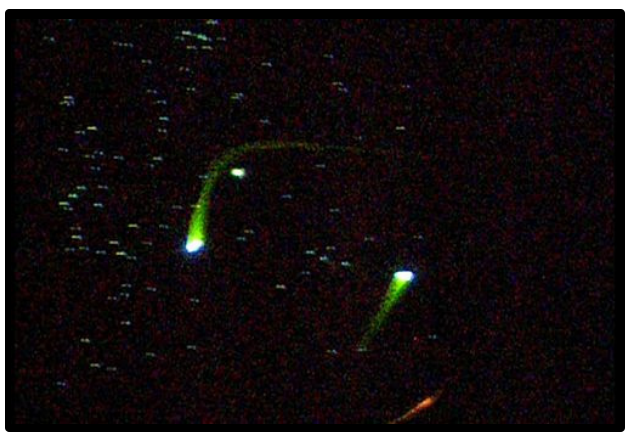
The gameplay of Spacewar involves two monochrome spaceships called "the needle" and "the wedge", each controlled by a player, attempting to shoot one another while maneuvering on a two-dimensional plane in the gravity well of a star, set against the backdrop of a starfield. The ships fire torpedoes which are not affected by the gravitational pull of the star. The ships have a limited number of torpedoes and a limited supply of fuel, which is used when the player fires his thrusters. Torpedoes are fired one at a time by flipping a toggle switch on the computer or pressing a button on the control pad, and there is a cooldown period between launches. The ships follow Newtonian physics, remaining in motion even when the player is not accelerating, though the ships can rotate at a constant rate without inertia.

Each player controls one of the ships and must attempt to shoot down the other ship while avoiding a collision with the star. Flying near the star can provide a gravity assist to the player at the risk of misjudging the trajectory and falling into the star. If a ship moves past one edge of the screen, it reappears on the other side in a wraparound effect. A hyperspace feature, or "panic button", can be used as a last-ditch means to evade enemy torpedoes by moving the player's ship to another location on the screen after disappearing for a few seconds, but the reentry from hyperspace occurs at a random location, and in some versions there is an increasing probability of the ship exploding with each use.

Player controls include clockwise and counterclockwise rotation, forward thrust, firing torpedoes, and hyperspace. Initially these were controlled using the front-panel test switches on the PDP-1

minicomputer, with four switches for each player, but these proved to be awkward to use and wore out quickly under normal gameplay, as well as causing players to accidentally flip the computer's control and power switches. The location of the switches also left one player off to one side of the CRT display due to the limited space in front of the computer, which left them at a disadvantage. To alleviate these problems, Kotok and Saunders created a detached control device, essentially an early gamepad. The gamepad had a switch for turning left or right, another for forward thrust or hyperspace, and a torpedo launch button. The button was silent so that the opposing player would not have a warning that the player was attempting to fire a torpedo during a cooldown period.

Spacewar was extremely popular in the small programming community in the 1960s and was widely recreated on other minicomputer and mainframe computers of the time before migrating to early microcomputer systems in the 1970s. Early computer scientist Alan Kay noted in 1972 that "the game of Spacewar blossoms spontaneously wherever there is a graphics display connected to a computer," and Graetz recalled in 1981 that as the game initially spread it could be found on "just about any research computer that had a programmable CRT". The majority of this spread took place several years after the initial development of the game; while there are early anecdotes of players and game variants at a handful of locations, primarily near MIT and Stanford, it was only after 1967 that computers hooked up to monitors or terminals capable of playing Spacewar began to proliferate, allowing the game to reach a wider audience and influence later video game designers—by 1971, it is estimated that there were over 1000 computers with monitors, rather than a few dozen. It is around this time that the majority of the game variants were created for various computer systems, such as later PDP systems,

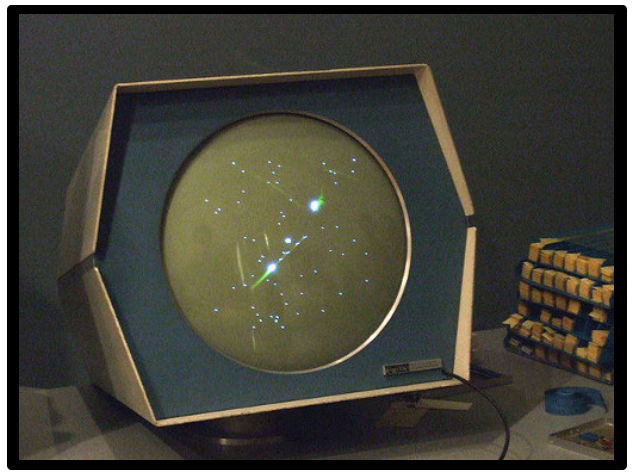


and in 1972 the game was well-known enough in the programming community that Rolling Stone sponsored the "SpaceWar! Olympics", possibly the first video game tournament.

In the early 1970s, Spacewar migrated from large computer systems to a commercial setting as it formed the basis for the first two coin-operated video games. While playing Spacewar at Stanford sometime between 1966 and 1969, college student Hugh Tuck remarked that a coin-operated version of the game would be very successful. While the high price of a minicomputer prevented such a game from being feasible then, in 1971 Tuck and Bill Pitts created a prototype coin-operated computer game, Galaxy Game, with a $20,000 PDP-11. Around the same time, a second prototype coin-operated game based on Spacewar, Computer Space, was developed by Nolan Bushnell and Ted Dabney, which would become the first commercially sold arcade video game and the first widely available video game of any kind. Though Tuck felt that Computer Space was a poor imitation of Spacewar and his game a superior adaptation, many players believed both of the games to be upgraded variants of Spacewar.

Two users playing Spacewar on a PDP-12 at the Vintage Computer Festival

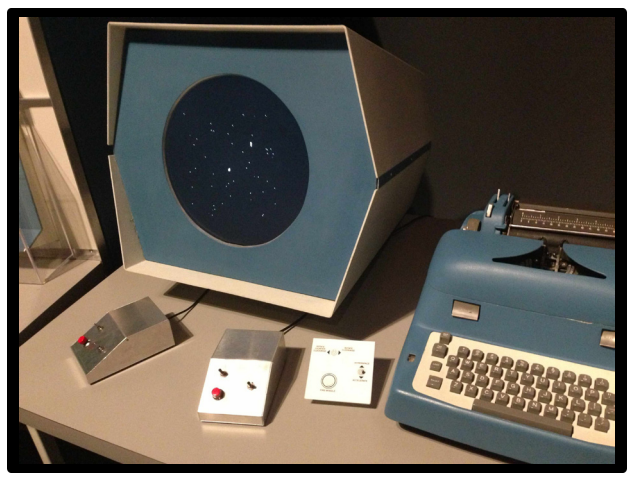
Byte magazine published an assembly language version of Spacewar in 1977 that ran on the Altair 8800 and other Intel 8080-based microcomputers using an oscilloscope as the graphical display and a lookup table for orbits, as well as a three-dimensional variant in 1979 written in Tiny BASIC. More modern recreations of the game for computers have been made as well. An emulated version of the original game, based on the original source code made publicly available by Martin Graetz and running in a JavaScript PDP-1 emulator, was made available to play on the internet in 2012. The only working PDP-1s that are known to exist are kept in



the Computer History Museum in Mountain View, California, where demonstrations of the machine are held, which include playing Spacewar.

In addition to Galaxy Game and Computer Space, numerous other games have been directly inspired by Spacewar. These include Orbitwar (1974, PLATO network computers), Space Wars (1977, arcade), and Space War (1978, Atari 2600). Additionally, in Asteroids (1979), designer Ed Logg used elements from Spacewar, namely the hyperspace button and the shape of the player's ship. Products as late as the 1990 computer game Star Control drew direct inspiration from Spacewar. Russell has been quoted as saying that the aspect of the game that he was most pleased with was the number of other programmers it inspired to write their own games without feeling restricted to using Russell's own code or design.

On March 12, 2007, The New York Times reported that Spacewar was named to a list of the ten most important video games of all time, the so-called game canon, which were proposed to be archived in the Library of Congress. The Library of Congress took up this video game preservation proposal, and began with the games from this list.



A replica of the round CRT and game controllers developed at MIT in 1962 to run Spacewar

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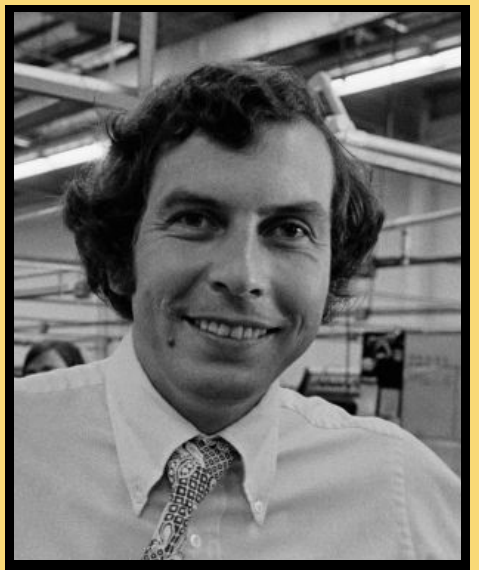
Computer Space

Manufacturer *Nutting Associates*
Release *1971*
Class *Wide Release*
Genre *Space*
Mode *1 Player*
Gameplay *Single*
Panel Layout *Single Player*
Controls
Buttons: *Rotational (left, right)*
Buttons: *2 [Fire MissileThrust]*
Hardware *Discrete logic*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Computer Space is a space combat arcade game developed in 1971 as one of the last games created in the early history of video games. Created by Nolan Bushnell and Ted Dabney in partnership as Syzygy Engineering, it was the first arcade video game as well as the first commercially available video game.

In the late 1960s, Nolan Bushnell saw Spacewar running on a mainframe at the University of Utah where he was a student. Bushnell worked during the summer at Lagoon Amusement Park in Utah as a manager of the games department overseeing the arcade games, and when he saw Spacewar he believed that an arcade game version of the game would be very popular. The high price of computers capable of running the game, however, meant that any such arcade game would not be economically feasible. After graduating from college Bushnell worked as an engineer in California for Ampex, an electronics company that worked in audio and video recording technology. He also met researcher Jim Stein, who worked for Stanford University's Stanford Artificial Intelligence Project; he learned from him that Spacewar was running on the laboratory's PDP-6, and played the game against him there when visiting. Soon after, he saw an ad for the Data General Nova computer, which cost only $4,000, and thought again about his Spacewar arcade game idea; he believed that at that price, if he were able to connect four monitors and coin slots to allow multiple games to run simultaneously, the game would be economically viable. He showed his office mate and fellow Ampex engineer Ted Dabney Spacewar at the Stanford laboratory, and the two agreed to work together to try and design a prototype of the game; Bushnell was more experienced with computers and digital engineering, while Dabney was more experienced with analog and hardware engineering, as he had been working on designing video processing and control circuits and power supplies.



Nolan Bushnell

After agreeing on an initial idea, Bushnell and Dabney began trying to design a prototype based on a Data General Nova. Initially they were joined by Larry Bryan, a computer programmer who also worked at Ampex. Bushnell and Dabney put $100 each into a partnership, named Syzygy by Bryan. They soon ran into difficulties with their planned design; the computer was not powerful enough to refresh the monitors as fast as was needed to make the game playable. Bryan realized this early on, when trying to design the code needed to run the games, and left the project before Syzygy was formed without ever contributing any money, but Bushnell and Dabney continued working on the design for several more months. The pair attempted to reduce the load on the computer by replacing subroutines—such as displaying the background stars—with specialized hardware, but it proved insufficient; even reducing the number of monitors was not enough. By the end of November 1970, Bushnell decided to abandon the project as untenable, while Dabney had stopped working on the design a while before. It is unclear if the pair were aware that Data General had demonstrated a more powerful variant of the Nova, sold for $8,000, running a single game of Spacewar at the Fall Joint Computer Conference in December 1968, though that solution would have been too expensive for an arcade game, which typically cost $1,000 at the time. Unable to put the game idea out of his mind, however, Bushnell soon thought of a way to manipulate the video signal on the screen without a computer controlling it, and from there Syzygy came up with the idea of removing the computer altogether and building specialized hardware to handle everything for the game instead.

Bushnell and Dabney began to design custom hardware to run the game's functions, and they soon discovered that the cost to build the whole game's computing systems would be much lower. As a result, they would not need to have multiple instances of the game running on

the same machine in order to be profitable. On the other hand, however, the custom hardware was not as powerful as the more expensive Nova computer, which meant that the pair needed to make gameplay modifications. Spacewar was a two-player game featuring dogfights around the gravitational field of a central star; neither of these features could be run on the dedicated circuits the pair were making, so the game was cut down to a single-player game wherein the player would fight against two computer-controlled spaceships in open space. By January 1971, the pair had built some basic hardware which could connect to a monitor, with plans to continue expanding it to make a game now named Cosmic Combat, but they were still far away from turning what was then a dot moving on a screen into a full Spacewar-like game cabinet.

In January 1971, Bushnell and Dabney founded Syzygy Engineering as an official company, now with a cash amount of $350. They approached Ampex and a prior manager of Dabney's with their prototype, but found no interest. The major arcade game manufacturers were based out of Chicago at the time, limiting their ability to demonstrate their idea to an existing firm. During a dentist appointment in early 1971, Bushnell told the dentist about the game and that he was looking for a manufacturer; the dentist in turn referred him to another patient of his, Dave Ralstin, the sales manager for Nutting Associates in Mountain View, California. Nutting had been founded in 1967 on the basis of Computer Quiz, an analog quiz arcade game, and by 1971 was looking for another hit game. After meeting with Bushnell, Nutting felt that his game was the potential success they needed to replace falling sales of Computer Quiz updates, as they had not had a hit game since. Nutting not only agreed to manufacture the game but also hired Bushnell as their chief engineer, as they had no real engineering team at the time. Furthermore, Syzygy Engineering retained ownership of the game, even though Nutting agreed to give Syzygy space to build the prototype and to manufacture the game once complete. Syzygy would be paid five percent of each cabinet sold. Bushnell negotiated to work on Cosmic Combat outside of normal working hours until it went into production in order to keep it conceptually separate from his new job at Nutting so as to prevent Nutting from

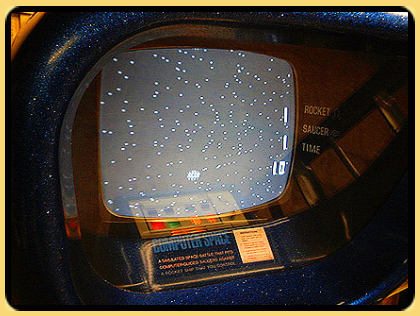
Once he moved to Nutting, Bushnell took over the majority of the engineering work for the game; Dabney has stated that he advised Bushnell on some of the design, and that some of the construction was done by Steve Bristow, an intern at Ampex. There is disagreement in interviews with Bushnell and Dabney as to how much work Dabney did on the final cabinet, with Dabney claiming credit for the controls, sound, power supply, initial wooden cabinet, and invention of the hyperspace color inversion, while Bushnell claims credit for everything but the sound, cabinet, power supply, and monitor. By August 1971, an initial prototype of the game—now named Computer Space to be similar to Computer Quiz—was complete, and Syzygy moved on to location testing. They installed the game at the Dutch Goose bar near Stanford University, where it met with great success. Nutting was heartened by the response and rushed to make several finished cabinets for the Music Operators of America (MOA) Music & Amusement Machines Exposition in October. Further location tests found a less enthusiastic response from customers confused by the game mechanics and controls, and Syzygy hurriedly tried to adjust the game to be more understandable to players.

The final Computer Space design uses no microprocessor or memory; the entire computer system is a state machine made of 74-series TTL chips, with graphic elements held in diode arrays. The array designs, which Bushnell designed to let him rotate the rocket in 16 directions with only 4 arrays, are laid out in the shape of the ships, which made it obvious to game operators what would need to be replaced if something broke. The ships themselves are projected on the screen as a pattern of dots, rather than connected lines, and the monitor they are projected on is a General Electric 15-inch black and white television screen, specially modified for the game. The rudimentary artificial intelligence constructed by Bushnell has the enemy ships firing towards the quadrant of the screen that the player's rocket is in, rather than a more complicated tracking algorithm.

Computer Space debuted at the MOA show on October 15–17, 1971. Dabney's wooden cabinet for the initial prototype was replaced with a curvy, futuristic fiberglass cabinet designed by Bushnell with modelling clay and built by a swimming pool manufacturer. A control panel extended from the main body of the cabinet and contained the four control buttons; Syzygy had hoped to use a joystick to control the rocket's movement, but found that it broke too easily, failing to last a single night in a location test. The Galaxy Game designers had run into the same issue, but had solved it with expensive customized military surplus joysticks. The cabinet displayed the Nutting Associates name and logo, along with the term "Syzygy engineered". Nutting displayed four cabinets at the MOA show, one each in red, blue, white, and yellow, with the implication that the game was already in production, though they were in fact the only four cabinets then produced. These initial cabinets were in solid colors, though later ones would use a sparkle finish. The cabinets were damaged during transport, and one monitor was broken; Syzygy repaired the three working cabinets and opened up the fourth to demonstrate the internals to attendees. Game distributors were hesitant about the game, with concerns raised about the game's potential, reliability, and the embedded monitor's attractiveness to thieves; recollections are mixed as to whether Nutting took a handful or no orders at the show. Nutting, however, ordered a large production run regardless, on the expectation that the distributors would come around with further exposure. The game was displayed again at the International Association of Amusement Parks and Attractions show from November 9–12, and then entered production later that month.

Nutting ordered an initial production run of 1,500 units of Computer Space, an optimistic decision given that a hit arcade game at the time would sell around 2,000 units, though a handful had reached 10,000. Reception to the game

from distributors was mixed; while some were excited by the game, others felt it to be confusing and part of a passing video game fad. By spring 1972 the game had sold over 1,000 units, and according to Bushnell in 1976 ended up selling between 1,300 and 1,500 units. While this was a commercial success, making over $1,000,000, it was a disappointment to Nutting, who had been hoping for a large-scale success like Computer Quiz. The game's relative lack of success was attributed to the complexity of its controls and a steep learning curve, which pushed away customers used to less complex games. Bushnell noted that the locations that the game did well in, like the Dutch Goose playtest location, were generally located near university campuses; the general market for coin-operated games, however, was in working-class bars, where the patrons were less interested in deciphering a complicated game. In the documentary Video Game Invasion: The History of a Global Obsession, Bushnell explained, "Sure, I loved it, and all my friends loved it, but all my friends were engineers. It was a little too complicated for the guy with the beer in the bar." Bushnell has also stated that part of the difficulty lay in the novelty of the game; he has said that even a few years later the controls and gameplay would have been more understandable to players who would have seen other video games by then. Conversely, Bushnell and Dabney have said that the game's novelty was also part of its appeal to players—most people had never seen a television screen displaying images being controlled by a person in front of it, rather than playing video from a remote television station.



In Computer Space, the player controls a rocket as it attempts to shoot a pair of flying saucers while avoiding enemy fire. The monochrome game has the three ships flying on a two-dimensional plane, set against the backdrop of a starfield. Missiles are fired one at a time, and there is a cooldown period between launches. The player's rocket follows Newtonian physics, remaining in motion even when the player is not accelerating, though the rocket can rotate at a constant rate without inertia. The flying saucers stay in place or glide in a zig-zag pattern around the screen in tandem, with one staying a constant distance directly below the other. If a ship or missile moves past one edge of the screen, it reappears on the other side in a wraparound effect. While the missile is in flight, the player can turn it left or right by turning their rocket.

Player controls are clockwise and counterclockwise rotation, forward thrust, and firing missiles. Whenever the player is hit by a missile or flying saucer, the screen flashes and the player's rocket spins rapidly and disappears, then reappears in the same location. If a flying saucer is hit by a missile, the screen flashes and the saucer briefly disappears. Counters on the right side of the screen keep count of the number of times the player's rocket has been destroyed and the saucers have been destroyed, as well as how long that round of gameplay has lasted. Rocket and saucer scores are displayed as a single seven segment charactor representing a hexadecimal value 0 to 15, after which the count resets and resumes from zero. Circuit hardware generates unique symbols to represent hex numbers 10 through 15 rather than the conventional charactors A -F which are ambigous in seven segment format. A round has an adjustable time limit of 60 to 150 seconds, with a default of 90; when the time limit is reached, the game ends if the player's score is lower than the computer's. If it is higher, the black and white colors invert in a "hyperspace" feature, and another round begins for free; the game continues on to new rounds with the display colors inverting indefinitely if the player continues to win. One round costs a quarter, or two quarters if the machine is adjusted against the instruction manual's recommendations.

While the game did not meet the high hopes of Nutting, it was successful enough that Nutting produced a two-player version of the game in July 1973 with a green fiberglass cabinet, built by Steve Bristow.

By May 1972, Bushnell and Dabney quit Nutting Associates and moved to incorporate Syzygy Engineering; they instead named it Atari due to another company with a similar name. Bushnell later stated that he was encouraged by the success of Computer Space in regards to future game ideas, as he had never before created something that made so much money, and additionally felt that his time at Nutting gave him confidence in running his own company because he "couldn't screw it up more than they did". Nutting Associates did not make any further Computer Space games before closing in 1976. Bushnell's enthusiasm was soon substantiated, as Atari's first game, Pong, went on to substantially greater success than Computer Space. Although not as influential as Pong, Computer Space's release marked the beginning of the commercial video game industry.

Galaxy Game

Manufacturer *Bill Pitts and Hugh Tuck*
Release *1971 - 1972*
Genre *Space*
Mode *2 Playes*
Cabinet Styles *Upright*

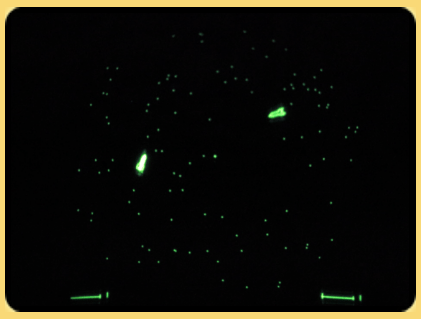
Galaxy Game is a space combat arcade game developed in 1971 during the early era of video games. Created by Bill Pitts and Hugh Tuck, it was one of the first coin-operated video games.

In 1966, Stanford University student Bill Pitts, who had a hobby of exploring the steam tunnels and buildings of the campus, broke into a building he found out to be the location of the Stanford Artificial Intelligence Project, which held a DEC PDP-6 time-sharing computer system with 20 Teletype consoles connected to it. Fascinated by the computer and having taken several introductory computer classes, Pitts convinced the head of the project, Lester Earnest, to let him use the computer after hours. Soon, Pitts had ceased going to classes, instead spending his nights in the computer lab interacting with the graduate and postgraduate students and playing Spacewar on the PDP-6. Pitts often played against Hugh Tuck, a student at California Polytechnic State University who was a friend from high school. During one Spacewar session that took place, depending on the source, between 1966 and 1969, Tuck remarked that a coin-operated version of the game would be very successful. Such a device was still unfeasible due to the cost of computers, and the pair did not pursue the project. In 1971, however, Pitts, who by then had graduated and was working at Lockheed as a PDP-10 programmer, learned of the 1970 DEC PDP-11, which was sold for around $14,000. While this was still too high for a commercially viable product, as most electronic games in arcades cost around $1,000 at the time, Tuck and Pitts felt it was low enough to build a prototype to determine interest and optimal per-game pricing.

After deciding to begin work on a coin-operated version of Spacewar, the pair, with assistance from Tuck's family, bought a PDP-11 and started working on a prototype. They spent a total of $20,000 to build a single arcade machine for two players, like the original Spacewar, deciding to price the game at ten cents per play or 25 cents for three games, with the winner of a match given a free game. They used a PDP-11/20 version of the PDP-11 ($14,000), a Hewlett-Packard 1300A Electrostatic Display ($3,000), and spent the remainder on the coin acceptors, joysticks, wiring, and casing. Pitts build the computer hardware and handled the programming, while Tuck, a mechanical engineer, designed the enclosing cabinet. The display adapter for the monitor was built by Ted Panofsky, the coin acceptors were sourced from jukebox manufacturer Rowe International, and the joysticks found at a military surplus store as remainders from B-52 bomber controls. The code for the game was based on a version of Spacewar running on a PDP-10 in the Stanford artificial intelligence lab, but modified with additional features.

Pitts and Tuck renamed their product from Spacewar to Galaxy Game due to anti-war sentiment and founded a company called Mini-Computer Applications in June 1971 to operate the game as it neared completion. The development of the prototype machine took around three and a half months. By August, they were well into development and had gotten permission to place the machine at the Tresidder student union building at Stanford as a test site. It was then that they received a call from Nolan Bushnell, who had heard of their project and wanted to show them his similar project he was working on.

Bushnell had also played Spacewar during the 1960s and wanted to make an arcade game version of it, but had gone in a different technological direction. He and Ted Dabney had initially started with a $4,000 Data General Nova computer which they thought would be powerful enough to run multiple simultaneous games of Spacewar; when it turned out to not be, they



had started investigating replacing the computer hardware with custom-built parts. They had soon discovered that while a general-purpose computer cheap enough for an arcade game would not be powerful enough to run enough games of Spacewar to be profitable, a computer purpose-built for solely running one game could be made for as low as $100. By August 1971 when Bushnell called Tuck and Pitts, he and Dabney had already displayed a prototype of their Computer Space game in a bar near Stanford and had found a commercial manufacturer for the game in Nutting Associates. They were curious about what Tuck and Pitts had done to make a commercially competitive version of the game, but were relieved, though also somewhat disappointed, to find that they had not solved that problem yet.

Tuck and Pitts, on the other hand, while impressed with Bushnell's hardware were not impressed with the game itself. They felt that Computer Space, a single-player game without the central gravity well of the original game, was a pale imitation of Spacewar, while their own Galaxy Game was a superior adaptation of the game. In November 1971, the Galaxy Game prototype debuted. The veneered walnut console, complete with seats for players, was located on the second floor of the building and connected to the PDP-11 in the attic by a 100-foot cable. It was very successful; Pitts later said that the machine attracted crowds of people "ten-deep" watching the players. They briefly attached a second monitor hanging above the console so that the watchers could more easily see the game. The low prices meant that they did not come close to making back the price of the PDP-11, but they were excited by the game's reception and had not intended the prototype to be profitable. As the initial Galaxy Game prototype was displayed to the public a few months after the first Computer Space prototype, it is believed to be the second video game to charge money to play.

As a result of the reception to Galaxy Game, Pitts and Tuck started work on an expanded prototype. For the second machine, they built a full blue fiberglass casing for the consoles, improved the quality of the joysticks with the help of a machine shop, and modified the computer with a newer display processor to support up to four games at once on different monitors—either multiple simultaneous separate games or up to four players playing the same game on two screens. They also placed the PDP-11 inside one of the consoles rather than in a separate location. While the original plan had been to work on driving down the development costs after the initial prototype, the popularity of the game convinced the pair to instead focus on making a better machine that could run multiple games to recoup the upfront investment. The new version was installed in a cafe in the student union building in June 1972, though with only two monitors due to space restrictions. The original Galaxy Game prototype was displayed at several locations around the area, but was not as successful as it had been at the student union building. By the time the second prototype was completed the pair had spent $65,000 on the project and had no feasible way of making up the cost with the machine or commercial prospects for a wider release. Pitts later explained that he and Tuck had been focused on the engineering and technical challenges of producing a faithful coin-operated Spacewar game and paid little attention to the business side of the project; he felt that Computer Space had been more commercially successful because Bushnell had focused more on the business side of his idea than the technical.

The gameplay of Galaxy Game, like Spacewar, involves two monochrome spaceships called "the needle" and "the wedge", each controlled by a player, attempting to shoot one another while maneuvering on a two-dimensional plane in the gravity well of a star, set against the backdrop of a starfield. The ships fire torpedoes, which are not affected by the gravitational pull of the star. The ships have a limited number of torpedoes and a limited supply of fuel, which is used when the player fires his thrusters. Torpedoes are fired one at a time, and there is a cooldown period between launches. The ships follow Newtonian physics, remaining in motion even when the player is not accelerating, though the ships can rotate at a constant rate without inertia.

Each player controls one of the ships and must attempt to shoot down the other ship while avoiding a collision with the star. Flying near the star can provide a gravity assist to the player at the risk of misjudging the trajectory and falling into the star. If a ship moves past one edge of the screen, it reappears on the other side in a wraparound effect. A hyperspace feature, or "panic button", can be used as a last-ditch means to evade enemy torpedoes by moving the player's ship to another location on the screen after disappearing for a few seconds, but the reentry from hyperspace occurs at a random location, and there is an increasing probability of the ship exploding with each use. Player controls include clockwise and counterclockwise rotation, forward thrust, firing torpedoes, and hyperspace. Galaxy Game features, as improvements over the original, optional modifications to the game to have faster ships, faster torpedoes, to remove the star and its gravitational field or reverse the gravity to push away from the star, and to remove the wraparound effect. The movement of the ships was controlled with a joystick, while the torpedoes, hyperspace, and game options are controlled via a panel of buttons.

The second Galaxy Game prototype was moved into the Computer History Museum in Mountain View, California in 2000.

PONG

Pong

Manufacturer	*Atari*
Release	*1972*
Class	*Wide Release*
Genre	*Ball and Paddle*
Mode	*2 Players simultaneous*
Gameplay	*Competitive*
Panel Layout	*Multiple Player*
Controls	
Rotary:	*Analog*
Sound	*Amplified Mono (one channel)*
Cabinet Styles	*Upright*

Pong is one of the earliest arcade video games. It is a table tennis sports game featuring simple two-dimensional graphics.

Pong is a two-dimensional sports game that simulates table tennis. The player controls an in-game paddle by moving it vertically across the left or right side of the screen. They can compete against either a computer-controlled opponent or another player controlling a second paddle on the opposing side. Players use the paddles to hit a ball back and forth. The goal is for each player to reach eleven points before the opponent; points are earned when one fails to return the ball to the other.

Pong was the first game developed by Atari. After producing Computer Space, Bushnell decided to form a company to produce more games by licensing ideas to other companies. The first contract was with Bally Manufacturing Corporation for a driving game. Soon after the founding, Bushnell hired Allan Alcorn because of his experience with electrical engineering and computer science; Bushnell and Dabney also had previously worked with him at Ampex. Prior to working at Atari, Alcorn had no experience with video games. To acclimate Alcorn to creating games, Bushnell gave him a project secretly meant to be a warm-up exercise. Bushnell told Alcorn that he had a contract with General Electric for a product, and asked Alcorn to create a simple game with one moving spot, two paddles, and digits for score keeping. In 2011, Bushnell stated that the game was inspired by previous versions of electronic tennis he had played before; Bushnell played a version on a PDP-1 computer in 1964 while attending college. However, Alcorn has claimed it was in direct response to Bushnell's viewing of the Magnavox Odyssey's Tennis game. In May 1972, Bushnell had visited the Magnavox Profit Caravan in Burlingame, California where he played the Magnavox Odyssey demonstration, specifically the table tennis game. Though he thought the game lacked quality, seeing it prompted Bushnell to assign the project to Alcorn.

Alcorn first examined Bushnell's schematics for Computer Space, but found them to be illegible. He went on to create his own designs based on his knowledge of transistor–transistor logic and Bushnell's game. Feeling the basic game was too boring, Alcorn added features to give the game more appeal. He divided the paddle into eight segments to change the ball's angle of return. For example, the center segments return the ball a 90° angle in relation to the paddle, while the outer segments return the ball at smaller angles. He also made the ball accelerate the longer it remained in play; missing the ball reset the speed. Another feature was that the in-game paddles were unable to reach the top of screen. This was caused by a simple circuit that had an inherent defect. Instead of dedicating time to fixing the defect, Alcorn decided it gave the game more difficulty and helped limit the time the game could be played; he imagined two skilled players being able to play forever otherwise.

Three months into development, Bushnell told Alcorn he wanted the game to feature realistic sound effects and a roaring crowd. Dabney wanted the game to "boo" and "hiss" when a player lost a round. Alcorn had limited space available for the necessary electronics and was unaware of how to create such sounds with digital circuits. After inspecting the sync generator,

he discovered that it could generate different tones and used those for the game's sound effects. To construct the prototype, Alcorn purchased a $75 Hitachi black-and-white television set from a local store, placed it into a 4-foot (1.2 m) wooden cabinet, and soldered the wires into boards to create the necessary circuitry. The prototype impressed Bushnell and Dabney so much that they felt it could be a profitable product and decided to test its marketability.

In August 1972, Bushnell and Alcorn installed the Pong prototype at a local bar, Andy Capp's Tavern. They selected the bar because of their good working relation with the bar's manager, Bill Gaddis; Atari supplied pinball machines to Gaddis. Bushnell and Alcorn placed the prototype on one of the tables near the other entertainment machines: a jukebox, pinball machines, and Computer Space. The game was well received the first night and its popularity continued to grow over the next one and a half weeks. Bushnell then went on a business trip to Chicago to demonstrate Pong to executives at Bally and Midway Manufacturing; he intended to use Pong to fulfill his contract with Bally, rather than the driving game. A few days later, the prototype began exhibiting technical issues and Gaddis contacted Alcorn to fix it. Upon inspecting the machine, Alcorn discovered that the problem was the coin mechanism was overflowing with quarters.

After hearing about the game's success, Bushnell decided there would be more profit for Atari to manufacture the game rather than license it, but the interest of Bally and Midway had already been piqued. Bushnell decided to inform each of the two groups that the other was uninterested—Bushnell told the Bally executives that the Midway executives did not want it and vice versa—to preserve the relationships for future dealings. Upon hearing Bushnell's comment, the two groups declined his offer. Bushnell had difficulty finding financial backing for Pong; banks viewed it as a variant of pinball, which at the time the general public associated with the Mafia. Atari eventually obtained a line of credit from Wells Fargo that it used to expand its facilities to house an assembly line. The company announced Pong on 29 November 1972. Management sought assembly workers at the local unemployment office, but was unable to keep up with demand. The first arcade cabinets produced were assembled very slowly, about ten machines a day, many of which failed quality testing. Atari eventually streamlined the process and began producing the game in greater quantities. By 1973, they began shipping Pong to other countries with the aid of foreign partners.

The Original Prototype, currently in the Computer History Museum collection

The Pong arcade games manufactured by Atari were a great success. The prototype was well received by Andy Capp's Tavern patrons; people came to the bar solely to play the game. Following its release, Pong consistently earned four times more revenue than other coin-operated machines. Bushnell estimated that the game earned $35–40 per day, which he described as nothing he'd ever seen before in the coin-operated entertainment industry at the time. The game's earning power resulted in an increase in the number of orders Atari received. This provided Atari with a steady source of income; the company sold the machines at three times the cost of production. By 1973, the company had filled 2,500 orders, and, at the end of 1974, sold more than 8,000 units. The arcade cabinets have since become collector's items with the cocktail-table version being the rarest. Soon after the game's successful testing at Andy Capp's Tavern, other companies began visiting the bar to inspect it. Similar games appeared on the market three months later, produced by companies like Ramtek and Nutting Associates. Atari could do little against the competitors as they had not initially filed for patents on the solid state technology used in the game. When the company did file for patents, complications delayed the process. As a result, the market consisted primarily of "Pong clones"; author Steven Kent estimated that Atari had produced less than a third of the machines. Bushnell referred to the competitors as "Jackals" because he felt they had an unfair advantage. His solution to competing against them was to produce more innovative games and concepts.

Several publications consider Pong the game that launched the video game industry as a lucrative enterprise. Video game author David Ellis sees the game as the cornerstone of the video game industry's success, and called the arcade game "one of the most historically significant" titles. Kent attributes the "arcade phenomenon" to Pong and Atari's games that followed it, and considers the release of the home version the successful beginning of home video game consoles. Bill Loguidice and Matt Barton of Gamasutra referred to the game's release as the start of a new entertainment medium, and commented that its simple, intuitive gameplay made it a success.

Atari remade the game on numerous platforms. In 1977, Pong and several variants of the game were featured in Video Olympics, one of the original release titles for the Atari 2600. Pong has also been included in several Atari compilations on platforms including the Sega Genesis, PlayStation Portable, and personal computer. Many of the companies that produced their own versions of Pong eventually became well-known within the industry. Nintendo entered the video game market with clones of Home Pong.

PONG

by

ATARI

a new product
a new concept
a new company

this is the product that revolutionized
the amusement game industry.

this is the company that conceptualized,
designed and introduced pong; this is the
company that is now integrating digital
computers, video technology and laser film
techniques into a host of new game breakthroughs.

Lawsuit from Magnavox

The success of Pong attracted the attention of Ralph Baer, the inventor of the Magnavox Odyssey, and his employer, Sanders Associates. Sanders had an agreement with Magnavox to handle the Odyssey's sublicensing, which included dealing with infringement on its exclusive rights. However, Magnavox had not pursued legal action against Atari and numerous other companies that released Pong clones. Sanders continued to apply pressure, and in April 1974 Magnavox filed suit against Atari, Allied Leisure, Bally Midway and Chicago Dynamics. Magnavox argued that Atari had infringed on Baer's patents and his concept of electronic ping-pong based on detailed records Sanders kept of the Odyssey's design process dating back to 1966. Other documents included depositions from witnesses and a signed guest book that demonstrated Bushnell had played the Odyssey's table tennis game prior to releasing Pong. In response to claims that he saw the Odyssey, Bushnell later stated that, "The fact is that I absolutely did see the Odyssey game and I didn't think it was very clever."

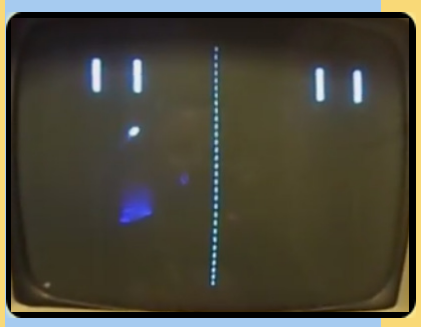
The Magnavox Odyssey, invented by Ralph H. Baer, inspired Pong's development.

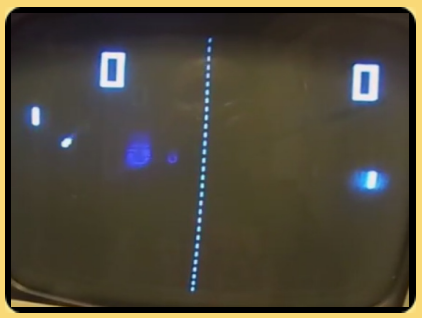
After considering his options, Bushnell decided to settle with Magnavox out of court. Bushnell's lawyer felt they could win; however he estimated legal costs of $1.5 million, which would have exceeded Atari's funds. Magnavox offered Atari an agreement to become a licensee for $700,000. Other companies producing "Pong clones"—Atari's competitors—would have to pay royalties. In addition, Magnavox would obtain the rights to Atari products developed over the next year. Magnavox continued to pursue legal action against the other companies, and proceedings began shortly after Atari's settlement in June 1976.

Computer Space Ball

Manufacturer	*Nutting Associates*
Release	*1972*
Class	*Wide Release*
Genre	*Ball and Paddle*
Mode	*2 Players simultaneous*
Gameplay	*Joint*
Panel Layout	*Multiple Player*
Monitor	
Orientation:	*Horizontal*
Type:	*TV Monitor*
CRT:	*Black and White*
Sound	*Amplified Mono (one channel)*
Cabinet Styles	*Upright*

Bill Nutting turned down Bushnell's offer of a 10% royalty to license Pong. Nutting was sure he could produce a similar game without Nolan's help. Bushnell's visit, in fact, may have given him a leg up on the competition. Not surprisingly then, Nutting's Computer Space Ball was one of the first Pong imitators on the market, perhaps even the first. Though some evidence suggests that the game was in production prior to March, when Allied Leisure released Paddle Battle, the evidence is unclear.





If Nutting did get its game to market first, it didn't do them much good. Aside from its possible status as the first Pong clone and its supremely uninspired name, there is little to distinguish Computer Space Ball from the horde of Pong imitators that appeared in 1973.

The game feature the same two-player ball-and-paddle gameplay as other Pong versions.

"allincolorforaquarter.blogspot.no"

Pong Fun Games

Manufacturer *Fun Games Inc.*
Release *1972*
Class *Wide Release*
Genre *Ball and Paddle*
Gameplay *Either*
Panel Layout *Multiple Player*
Hardware *Taito System H*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Pong Fun Games was produced by Fun Games Inc. in 1972.

The game is a sit down Pong style coin op. videogame for 2 people. Each has 2 knobs. It has 8 games variations, a score keeper and a glass top.

Star Trek

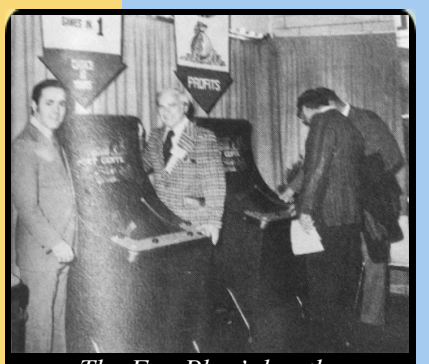
Manufacturer *For-Play*
Release *1972*
Class *Wide Release*
Genre *Space*
Mode *2 Players simultaneous*
Gamplay *Competitive*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Star Trek by Burbank's For-Play Manufacturing, released (allegedly) in September of 1972, a full two months before Pong's official release (though prototype versions of Pong had been in the field for some time prior. Star Trek was supposedly a straight clone of Computer Space. The game featured an upright cabinet and a crude joystick control device. The flyer artwork features inaccurate depictions of the USS Enterprise. According to legend For-Play had never bothered to get the rights to the TV series Star Trek so when the producers found out about the game, production came to a rapid halt. Unfortunately, little is known about the game and even less about the company that made it. Even the release date is unconfirmed.

For-Play didn't last much longer after Star Trek. In 1973 they produced a pair of Pong clones - Rally (March) and Sport Center. They also made non-video arcade pieces like Bio Computer and a dice-themed rifle/wall game called Las Vegas Gallery. By the end of 1973 they had apparently disappeared.

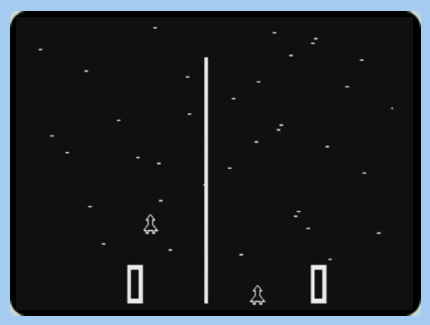
Some sources say this one was never made, and the flyer only contains a mock-up of a cabinet.

"allincolorforaquarter.blogspot.no"



The For-Play's booth at the 1973 MOA show

Astro Race



Manufacturer *Taito*
Release *1973*
Class *Wide Release*
Genre *Racing*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Joystick: *4-way (up, down, left, right)*
Hardware *Discrete Logic*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

"Most exciting new video game featuring spaceships journey in the cosmos. Manage the ship at your side to pass through a meteoric swarm without crashing into it."

Astro Race was produced by Taito in 1973. The game is a space game where players race against opposing ships while avoiding comets and meteors.

The game is controlled using a four-way joystick controller: Pushing the starting button and the Spaceship will appear from the bottom of the screen. Controlling the ship are done by the control lever. Pushing the lever forward permits the ship to go upward, and pushing the lever towards oneself allows the ship to go downward. Player scores point when he succeds to pass the ship through the meteorites. Players compete with the opposite player for the highest score. When the ship comes into collision, it disappears and returns to the start. It has a adjustable playtime from 1.5 to 4 minutes. The bar at the center of the screen indicates the time elapsed. Pushing the replay button (red) start the second game.

Asteroid

Manufacturer *Midway Manufacturing Co.*
Release *1973*
Class *Wide Release*
Genre *Space*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Hardware *Discrete Logic*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
Panel Layout *Multiple Player*
Controls
Joystick: *2-way (up, down)*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

"A deep-space TV thriller from Midway"

Asteroid is Midway's license of Atari's Space Race released in 1973

The length of play is regulated by a timer that starts when the start button is pushed. Players fly up towards the top of the screen, and can control their speed upwards. Asteroids (a one scan line high blob) fly from left to right, and the players try to avoid them. Whenever a player is hit, he starts again at the bottom of the screen. When a player reaches the top of the screen, he gains a point. The winner is the person with the most points.

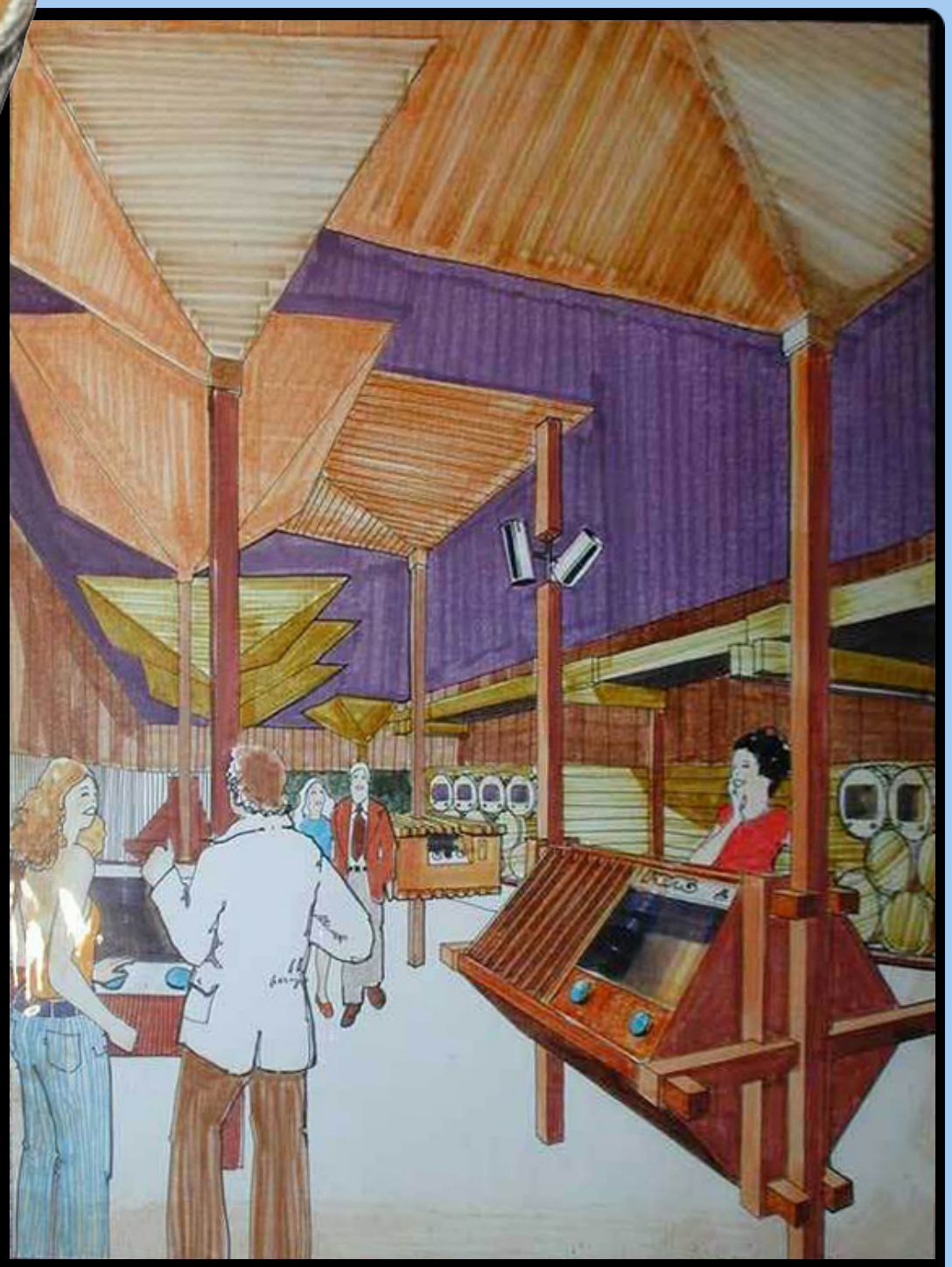
The arcade has additional adjustable timer control. Dimensions are 26 1/2" wide, 24" deep, 64" high. The pcb is etched with 'Astroid'.

Pong In-A-Barrel

Manufacturer *Atari*
Release *1973*
Genre *Ball and Paddle*

Pong In-A-Barrel was a version of Pong created by Atari with a cabinet that appeared to be an actual wine barrel, with the monitor embedded down inside the top of a barrel, a protective glass lid and controllers on opposite sides of the screen. They had fiberglass on the inside, and were supposedly pretty messy inside. Players would sit on benches or chairs on either side of the barrel to play, like what became known as a "cocktail cabinet", but taking less space. In an interview with arcade-museum.com, Atari founder Nolan Bushnell explained that Atari made about 20 different wine barrel games, but stopped production because the barrels would fall apart. According to Regan Cheng, Atari was manufacturing these right before he arrived. He and Pete Takaichi worked on these a little, one of their first projects.

"mamedev.emulab.it"



Concept drawing by Regan Cheng at Atari. A sketch on Chuck E Cheese when it was first concieved

Barrel Pong

Manufacturer *Atari*
Release *1972/1973*
Hardware *Atari Discrete Logic*
Genre *Ball and Paddle*
Hardware *Atari Discrete logic*
Sound *Monaural (Mono)*
Cabinet Styles *Upright*

Pete Takaichi and Regan Cheng worked on these "Barrel Pong's" as one of their first projects. The units were pretty messy inside , at least the earlier units were. They had fiberglas in the inside.

"Ferris@atariage.com"

Computer Space 2 Player

Manufacturer *Nutting Associates*
Release *1973*
Class *Wide Release*
Genre *Space*
Mode *2 Players simultaneous*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
GE Tube Television
Cabinet Styles *Upright*

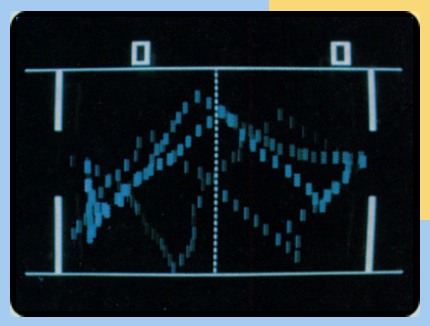
While the first Computer Space did not meet the high hopes of Nutting, it was successful enough that Nutting produced a two-player version of the game in July 1973 with a green fiberglass cabinet, built by Steve Bristow; the design was initially contracted to Bushnell, but was either uncompleted or unused. The game had no further involvement from Bushnell or Dabney, and was not a large success.

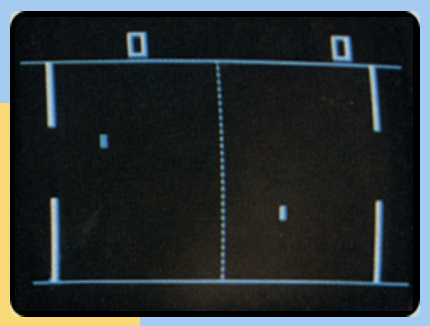
Players user the joystick button to fire a shot, then control it's trajectory with the joystick to hit the enemy UFO's. The bullet stays active and wraps around the screen continuously until players fire another shot. The game is timed, and ends when the timer ends.

Crazy Foot

Manufacturer *Bally Manufacturing Co.*
Release *1973*
Genre *Ball and Paddle*
Cabinet Styles *Upright*

Crazy Foot was produced by Bally Manufacturing Co. in 1973. It is a soccer-themed game.





excerpt from the flyer:

a tv -fotball-topper!

- *Total free paddle movement over both halves of playfield*
- *Exciting goal features for boasting experts*
- *Gradually accelerating ball speed*
- *Realistic moments of scoring action*
- *Flashing ball reappearances after each goal*

Soon to become player's favorite!

- *Constant visible scores out of playfield*
- *Adjustable goal dimensions*
- *Adjustable speed accelerator*
- *Adjustable timer unit*
- *Adjustable to 11 or 15 balls*
- *Ball deflection after 5 identical impacts*
- *Adjustable to 1 or 2 coins per play*

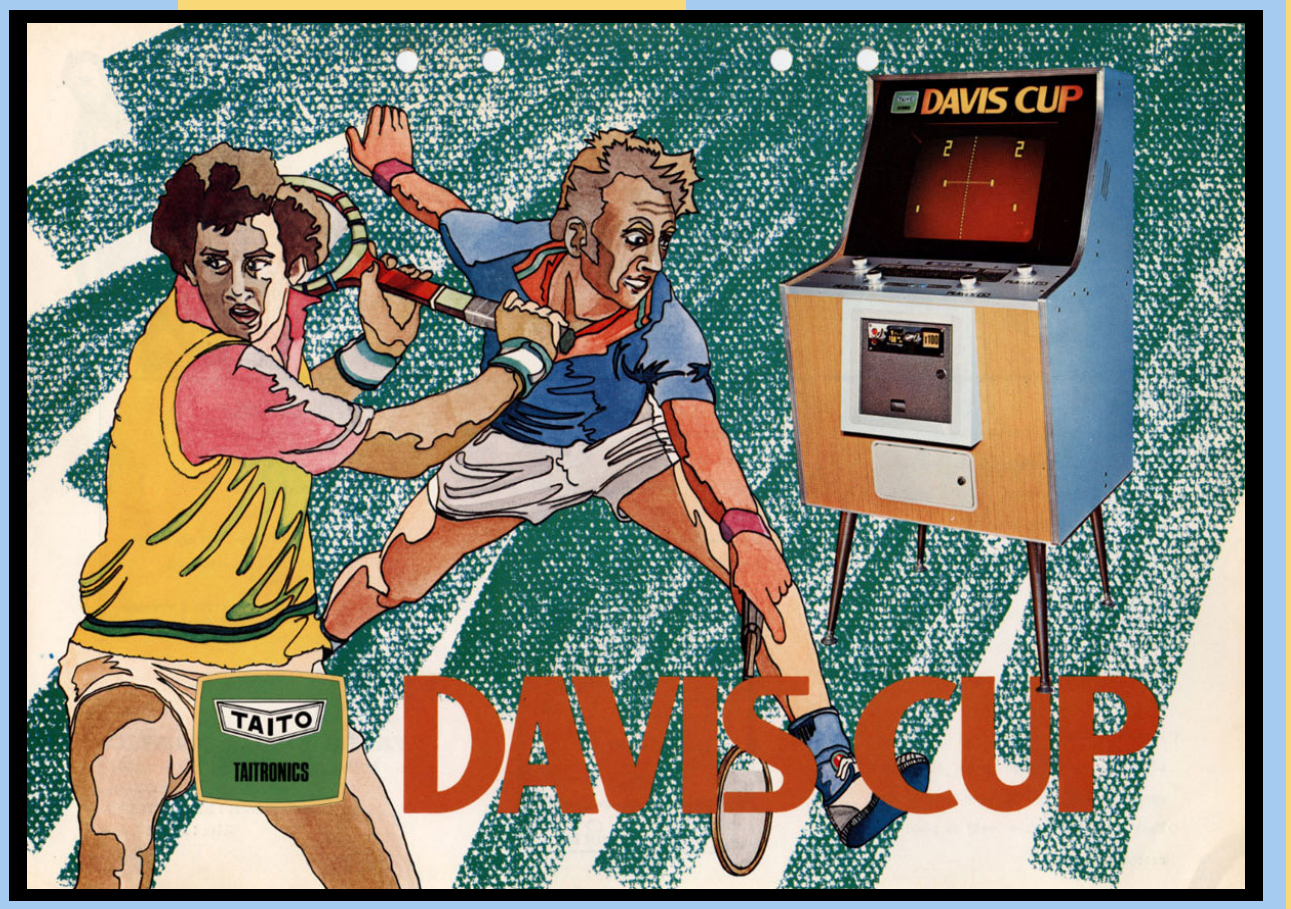
It's more than good, it's great!

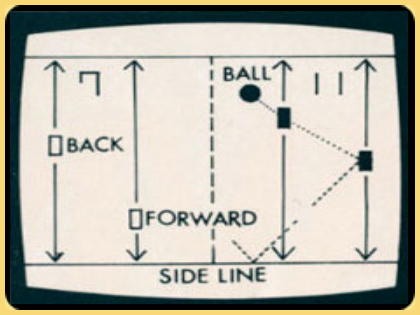
- *Famous unbreakable handles for complete paddle control*
- *Special L.B. tester and paddle position stabilizer*
- *Total solid state tv-monitor*
- *Giant tv-screen*
- *Dimensions 176x70x70 cm - 68x27x27 inch*
- *weight net 100 kg - 220 lbs*
  gross 105 kg - 231 lbs

Davis Cup

Manufacturer *Taito*
Release *1973*
Class *Wide Release*
Genre *Sports*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Controls
Rotary *Analog [Left Hand]*
Rotary *Analog [Right Hand]*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Davis Cup is an early team sport video game, a tennis doubles game with similar ball-and-paddle gameplay to Pong but played in doubles, allowing up to four players to compete.





excerpt from the flyer:

How to Play

• Select singles-game or doubles-game.
• A game begins by pushing the starting button (green) for singles-game and the starting button (blue) for double-game.
• Manipulate your knob to move the paddle up and down and hit the ball by the paddle.
• Direction of the returning ball is determined by the point of the paddle where contact is made. When the ball touches the side-line, the ball will rebound.
• A game is won by either one of the players when he scores 11 points or 15 points against his opponent. (Score is adjustable.)
• Push the replay button (red) to start the second game.

Features:

1. All solid state electronic components for long life and rugged use.
2. Adjustable game points (11 points or 15 points.)
3. In double-game, the ball passing thru the back of the forward is deflected.
4. Large 20-inch TV screen.

Specifications:

Height:	*1524 m/m*
Width:	*719 m/m*
Depth:	*730 m/m*
Weight:	*60 kg*
Power:	*AC100V 105W 50/60 Hz*
Cabinet:	*Laminated Melamin Board*
Coin Acceptor:	*Accepts 2 different coin sizes*

Doctor Pong

Manufacturer	*Atari*
Release	*1973/1974*
Genre	*Ball and Paddle*
Mode	*2 Players simultaneous*
Hardware	*Atari Discrete Logic*
Sound	*Amplified Mono (one channel)*
Cabinet Styles	*Upright*

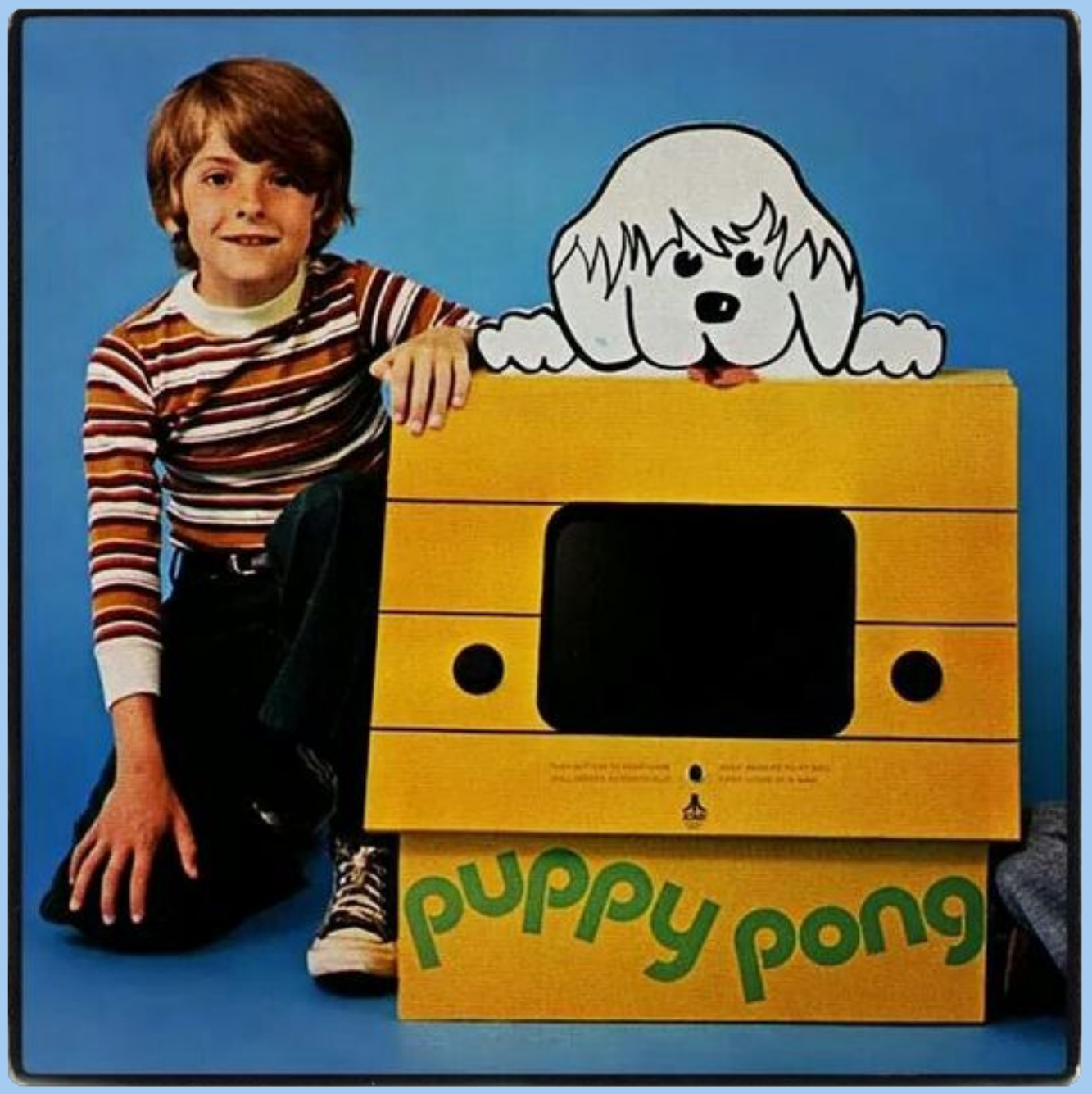
Puppy Pong

Snoopy Pong

Doctor Pong, also known as "Puppy Pong" was an adaption of the original arcade Pong for use in a non-coin-operated environment. It was conceptualized by Nolan Bushnell, Steve Bristow and a marketing firm to move their arcade games into a non-arcade environment—in this case to help occupy children in paediatricians' waiting rooms. Originally designed to be model of Snoopy's doghouse with Pong built into the side of it, when Charles Schulz declined Atari the use of Snoopy the model was changed to a generic doghouse with a puppy looking over the top. Puppy Pong saw a limited production run and was in testing stage at Chuck E. Cheese's early locations.

The original Snoopy Pong cabinet was designed by Regan Cheng of the Atari Industrial Design group. The follow-up Puppy Pong cabinet was designed by Regan's manager, Chas Grossman.

Both cabinets consisted of a doghouse housing a Pong board modified to not use a coin drop as a start trigger. The original Pong automatically starts several seconds after a coin is inserted. In Doctor Pong and Puppy Pong, a "start button" was instead wired up to start the games, set under the vertically mounted television in the dog house "roof". Instead of a traditional control panel, spinners are mounted directly on the roof as well.



Gotcha

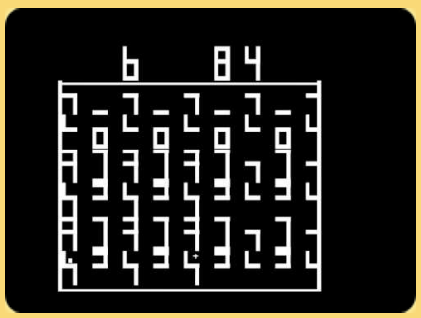
Manufacturer *Atari*
Release *1973*
Class *Wide Release*
Genre *Labyrinth/Maze*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Hardware *Discrete Logic*
Panel Layout *Multiple Player*
Controls
Trackball: *Optical*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

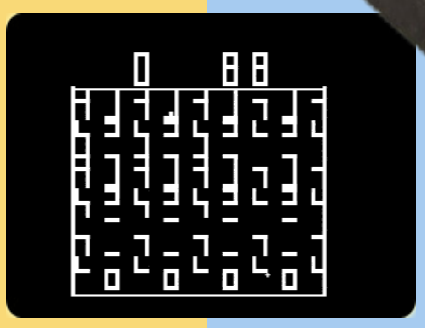
Gotcha, released in October 1973, was the fourth game by the company, after the 1972 Pong and the 1973 Space Race and Pong Doubles.

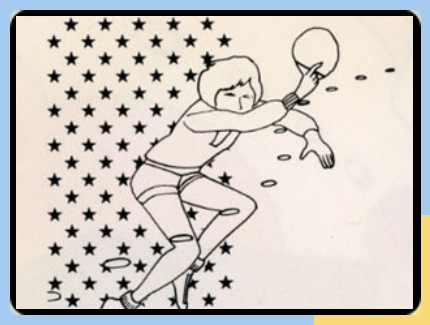
The game is a two-player maze game in which one player attempts to catch the other. The maze is composed of a repeating pattern of elements set in multiple columns on the screen. The "Pursuer" is represented by a square, while the "Pursued" is identified by a plus sign. As the Pursuer gets closer to the Pursued, an electronic beeping sound plays at an increasing rate until the Pursuer reaches the Pursued. Whenever the Pursued is caught, the Pursuer scores a point, the maze disappears for a brief moment, and the Pursuer is moved to a random position on the right side of the screen. There is no score for the Pursued, so determining who won is left to the players. The maze itself is continually changing, with two invisible lines half a screen apart scanning down the maze and overwriting maze elements. Above the maze is the Pursuer's score and the time elapsed in the game. Each game is for a set period of time. When time runs out, the game enters attract mode, where the score resets and the square and plus sign begin bouncing around the maze in a diagonal pattern as the maze continues to change.

The cabinet for the game was designed by Atari's product designer, George Faraco. His designed featured a joystick for each player, which was encased in a pink dome that the player would rest their hands on to control the joysticks, meant to resemble breasts. Faraco later acknowledged that "they didn't have bumps on them or anything, but the way they were the size of grapefruits next to each other, you got the impression of what they were supposed to be." Atari's second engineer, Don Lange, who assisted with the game, has also stated that the design was intentional on the part of Faraco, who fellow Atari designer Regan Chang has claimed "had some really far out ideas". According to rumour, Faraco got the idea from a joke that joysticks resembled phalluses, and that Atari should make a game with female controls. Like Faraco's initial design for Space Race, which was changed due to its expense after a few dozen units, the joysticks for Gotcha were changed to standard ones shortly into the production run prior to the October 1973 release. The design did inspire the advertising flyer for the game, however, which features a man chasing a woman in a nightdress with the initial design of the cabinet behind them. The final cabinet stands over 5 feet tall and weighs nearly 200 pounds. The breast-like controllers reappeared in yellow in prototype versions of the 1974 Touch Me arcade game, but were not used in production.

Gotcha was not commercially successful; later sources have described it as receiving a "lukewarm reception" and "arousing little more than controversy". Additionally, despite Gotcha's prominence as Atari's fourth game and their second game not related to Pong, the 1973 arcade video game market was largely dominated by Pong clones; while Pong was the fourth arcade video game ever produced, Gotcha was approximately the twentieth, with nearly all the other games released before and after Gotcha through the end of the year Pong clones.







Elepong

Manufacturer *Taito*
Release *1973*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Hardware *Discrete Logic*
Panel Layout *Multiple Player*
Controls
Rotary: *Analog*
Monitor
Orientation: *Horizontal*
Type*: Raster:* *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

ELEPONG

Elepong is a Pong variant,, and likely Taito's, and Japans, first ever arcade game release. Two players compete in bouncing a ball back together scoring a point when the other misses.

excerpt from the flyer:

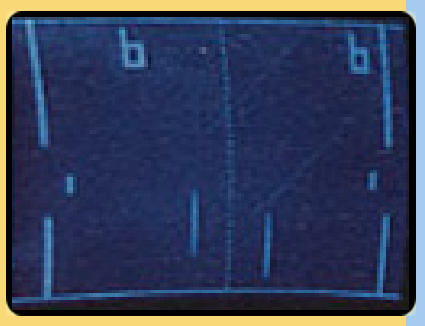
• Taito Elepong is a electronically simulated Ping Pong game visually displayed on a TV screen.
• The ball is automatically served from the net and the players attempt to hit the ball with their paddles (which are on both side of the net) by controlling its vertical positions with the control knobs located in the front of the cabinet.
• Players score points when they manage to hit the ball past the opponent's paddle and out of the screen.
• A game is won by either one of the players when he scores 11 or 15 points against his opponents.

Features:

1. All solid state electronic components for long life and rugged usage.
2. Adjustable game points (11 points or 15 points)
3. Built-in acoustic system captures the realistic sound of the paddle hitting the ball.
4. Large 20-inch TV screen.

Hockey TV

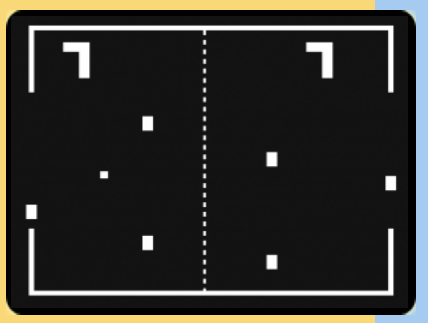
Manufacturer *Sega*
Release *1973*
Class *Wide Release*
Genre *Sports*
Mode *2 Players simultaneous*
Gameplay *Joint*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Amplified Mono (one channel*
Cabinet Styles *Upright*



Hockey TV (also referred to as TV Hockey, depending on region) is a discrete logic arcade game released by Sega in 1973. It is essentially Pong with two sets of paddles.

Hockey

Manufacturer *Ramtek*
Release *1973*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Controls
Rotary: *Analog*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*



"Here's a totally different video game, one that simulates the dynamic power play in hockey. One knob controls both the defensive goalie and the offensive forwards, enabling two players to satisfy their natural competitive spirit. For a single player HOCKEY offers the maximum challenge to physical dexterity and game playing skill.".

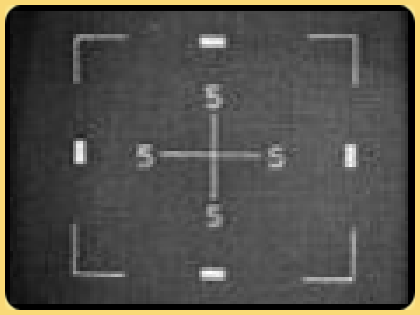
Hockey was produced by Ramtek in 1973. One goalie and two wings move simultaneously for each player. The first player to score nine goals wins.

The sides of the cabinet have a wood grain finish. Decals of the goals are situated on both ends of the screen over the actual scoring zones. A decal of a hockey player appears behind each goal.

Leader

Manufacturer *Midway Manufacturing Co.*
Release *1973*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *4 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Controls
Rotary: *Analog*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*
Cocktail

"It's a TV knock-out!"



Midway Leader was licensed from Ramtek's Wipe Out.

The object of the game is to score 15 points before the opponent. This is done by deflecting the ball with the paddle, trying to score a miss by the other player. A point is scored to the opposite player for every one missed by his opponent until one or the other reaches a score of 15. This is where the similarity to Pong ends. In a two-player game, player one controls the paddles on the left and right side of the screen simultaneously and player two controls the paddles at the top and bottom of the screen at the same time as well. In a four-player game, each player controls one of the four paddles located on the screen, with players one and two being the left and right paddles and players three and four being the top and bottom paddles.

In the middle of the screen there is a wall section that looks like a large plus sign. This is used to deflect the ball randomly around the screen.
Miscellaneous

Because of the limited action and the constant displaying of the game visuals on the screen, the monitor suffers permanent burn-in that is quite noticeable when the game is off.

"arcade-museum.com"

Missile Radar

Manufacturer *Nutting Associates*
Release *1973*
Class *Wide Release*
Genre *Shooter*
Mode *2 Players*
Gameplay *Alternating*
Panel Layout *Single Player*
Controls
Rotary: *Analog*
Buttons: *1 [Fire]*
Hardware *Discrete Logic*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Missile Radar was produced by Nutting Associates in 1973.

In the game, players set radar missiles in position and fire them to destroy on-coming enemy warheads.

Nolan Bushnell supposedly saw Missile Radar which later provided the basis for the idea that became Missile Command.

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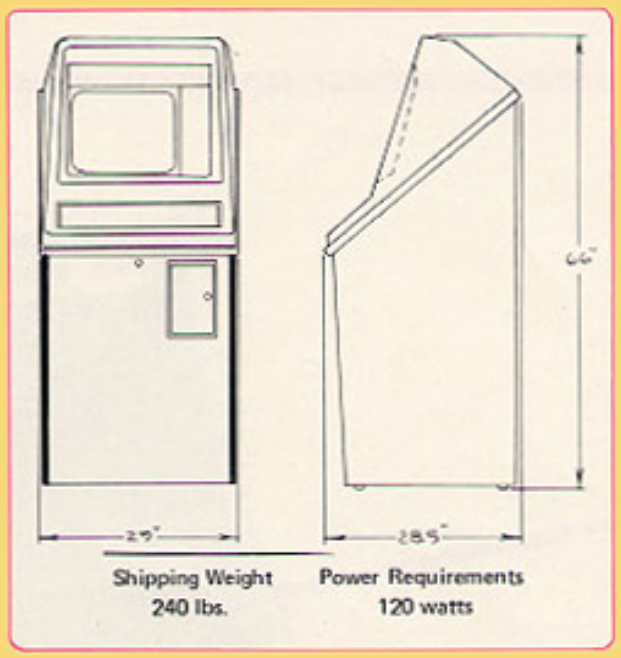
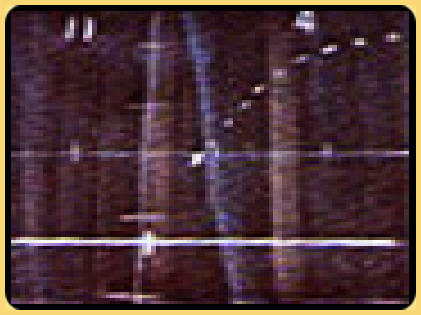


missile radar



excerpt from the flyer:

- ***Here Comes The Enemy Warhead!***
- ***Set The Radar Missile In Position!***
- ***Fire!***
- ***Another Enemy Warhead Is Destroyed!***

All the action takes place on an exciting radar screen. Radar Missle challenges the player to quickly coordinate missile position and firing time to intercept and destroy the fast flying warheads.
Enemy warheads arc over screen and explode on ground if not destroyed.
Intense, realistic
Intense, realistic sounds add to the tension and excitement.
Radar screen brightens and fades just like a real radar set.

Features

- ***25c play*** *- for more profit*
- ***EZ sevice cabintet*** *- all collecting, servicing and adjustment are easily and quickly accomplished from the front*
- ***MaxiSafe coin box*** *- locked, heavy gauge steel box protects collections*
- ***InstaFix modular circuitry*** *- makes field repairs fast and simple*
- ***Attract mode*** *- flying rockets, rocket sounds and flashing name*
- ***Extended play*** *for high score*
- ***Adjustable time*** *- 1 to 2 1/2 minutes*
- ***Full one-year factory warranty*** *on computer circuit boards*
- ***Solid-state cool running TV*** *for long, trouble-free life*
- ***Built-in test pattern*** *for fast TV adjustments*

Olympic TV Hockey

Manufacturer *Chicago Coin*
Release *1973*
Genre *Sports*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Olympic TV Football

Manufacturer *Chicago Coin*
Release *1973*
Genre *Sports*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Olympic TV Football is a black and white soccer-like ball and paddle game from Chicago Coin.

Koci claims that Olympic TV Football was the European version of Olympic TV Hockey (they probably changed the name since Europeans would be more familiar with football/soccer than hockey).

Olympic Tennis

Manufacturer *See-Fun*
Release *1973*
Class *Wide Release*
Genre *Sports*
Mode *4 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Controls
Rotary*: Analog*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

"Exciting new electronic match-point tennis game."

excerpt from the flyer:

Full 22" TV screen brings a new dimension to a competitive game of skill.

- *11 or 15 points scoring*
- *2 Players - one quarter*
- *4 Players - Two quarters*

Push button game start.
Ease of servicing - Modular plug-in components.
Glare free viewing.
Volume control with preventative stops.

Size: Height 60"
Width 33 3/8"
Depth 27 3/4"
Crated Weight: 250 lbs.
Voltage: 110-220V 2 amps
Formica Cabinet-Levelers

Paddle Battle

"Allied's Biggest Secret IS OUT!!!
There's no competition...
Just MONEY MONEY MONEY"

Paddle Battle is a common ball and paddle game from Allied Leisure.

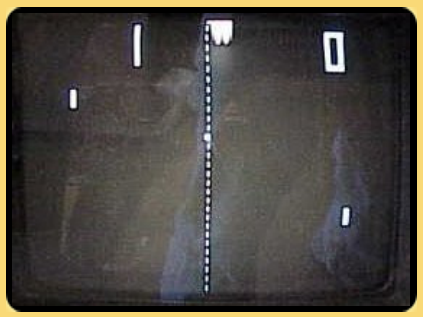
Manufacturer *Allied Leisure Industries*
Release *1973*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Controls
Rotary: *Analog*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Paddle-Ball

Manufacturer *Williams Electronics, Inc.*
Release *1973*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Controls
Rotary: *Analog*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

"Most Exciting Two Player Game In A Decade!"

Paddle-Ball is a common ball and paddle game from Williams. The machine feature a tilt mechanism, they borrowed from a Williams pinball game.

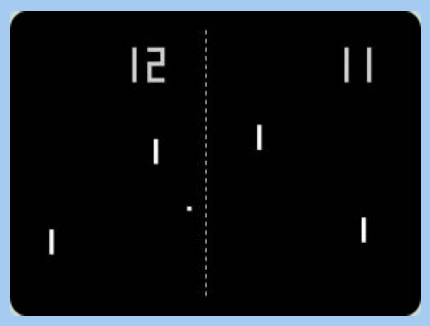


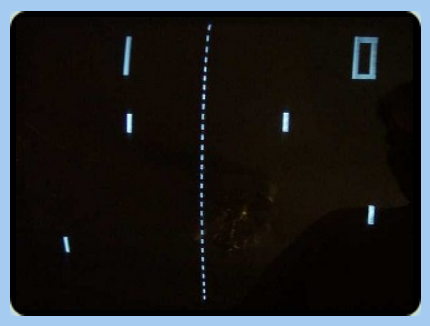
excerpt from the flyer:

- Can Be Operated Anywhere
- Compact But Great
- Solid State TV and Components
- Realistic Game Sound
- Phenomenal Earnings-Lasting Appeal

Formica Cabinet.
Williams Front Door Assembly & Cash box.
Tilt Switch-Cabinet Levellers-Coin Counter.
Volume Control with Preventive Stops.
Easy Service Disconnects to TV, PC Board, Power Supply & Front Door.
Quarter Per Game - Two Can Play.

Order with Confidence -
"PADDLEBALL" is the Best!

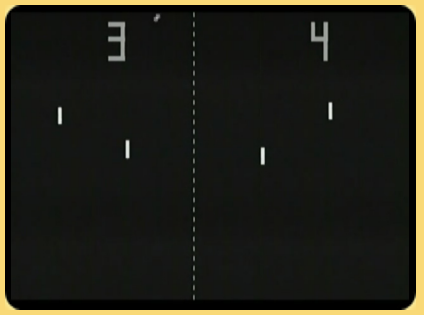




Pong Doubles

Manufacturer	*Atari*
Release	*1973*
Class	*Wide Release*
Genre	*Ball and Paddle*
Mode	*4 Players simultaneous*
Gameplay	*Either*
Panel Layout	*Multiple Player*
Hardware	*Discrete Logic*
Controls	
Rotary:	*Analog*
Rotary:	*Analog*
Sound	*Amplified Mono (one channel)*
Cabinet Styles	*Upright*

"Atari's New Video Game
2 or 4 Players"



Pong Doubles is the follow-up game to Pong, where up to four people can play. Two players on one side bat a ball to the other side where it is fielded by the other two players.

excerpt from the flyer:

featuring new giant screen
all solid state components
one year computer warranty
plus all the features of the original PONG.

2 players for 25c
4 players for 50c
operatir adjustable to 4 players for 25c

Specifications:
height - 58"
width - 31"
depth - 29"
shipping weight -
210 lbs

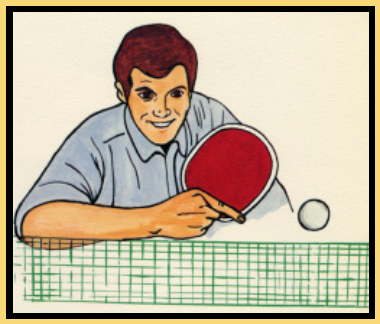
Pong Tron

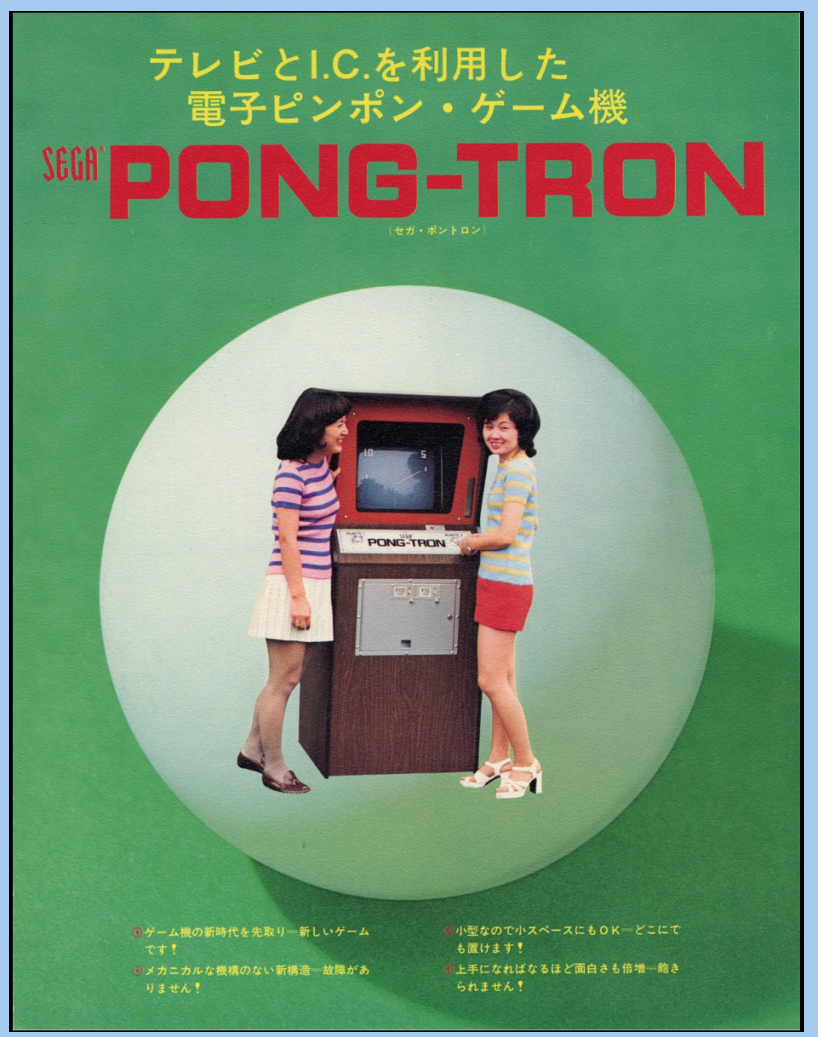
Manufacturer *Sega*
Release *1973*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *2 Players simultaneous*
Gameplay *Joint*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Pong-Tron is a 1973 discrete logic arcade game produced by Sega. It is a Pong-clone built specifically for Japanese audiences.

Pong-Tron differs very little from Atari's offering, however this release is significant as it stands as Sega's first arcade game to incorporate a CRT monitor and thus be classed as a "video game". Prior to Pong-Tron's release, Sega had built its successes through electro-mechanical arcade games, pinball tables, slot machines and jukebox distribution.

Pong-Tron followed later in the year by the updated Pong-Tron II (and Hockey TV, another pseudo-Pong clone). The housing was also recycled for Balloon Gun. Sega's main competitor at the time, Taito also released a similar Japanese clone in the form of Elepong, also in 1973.





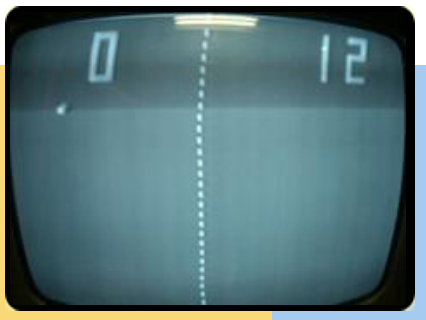
Pong Tron II

Manufacturer *Sega*
Release *1973*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Pong-Tron II is a 1973 discrete logic Pong clone produced by Sega. It is a follow-up to Pong-Tron, released earlier in 1973.

Pro Tennis

Manufacturer *Williams Electronics, Inc.*
Release *1973*
Genre *Sports*
Mode *4 Players*
Cabinet Styles *Upright*



Pro Tennis was produced by Williams Electronics, Inc. in 1973.

excerpt from the flyer:

You've tried the rest.
Now buy the best!

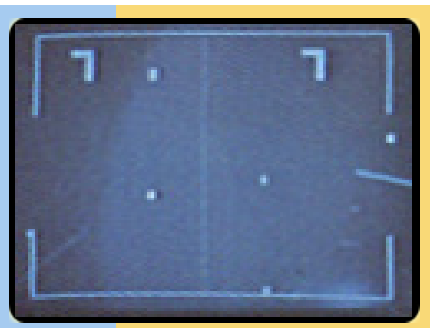
Williams' 4-Player T.V. Tennis Game on 25c Play (50c per game) will get the job done on any location.

Appearance, Sound, Play Appeal and excellent craftmanship make "PRO-TENNIS" the leader in the field.

Full Size 23" Screen.
11 or 15 point scoring.

Pro Hockey

Manufacturer *Taito*
Release *1973*
Class *Wide Release*
Genre *Sports*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Controls
Rotary: *Analog*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*



Pro Hockey, produced by Taito, is a hockey game where players try to get the puck into their opponent's goal. The gameplay is similar to Pong.

Rally

Manufacturer *For-Play*
Release *1973*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Controls
Rotary: *Analog*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Rally is a competitive, fast-action ball and paddle game.

excerpt from the flyer:

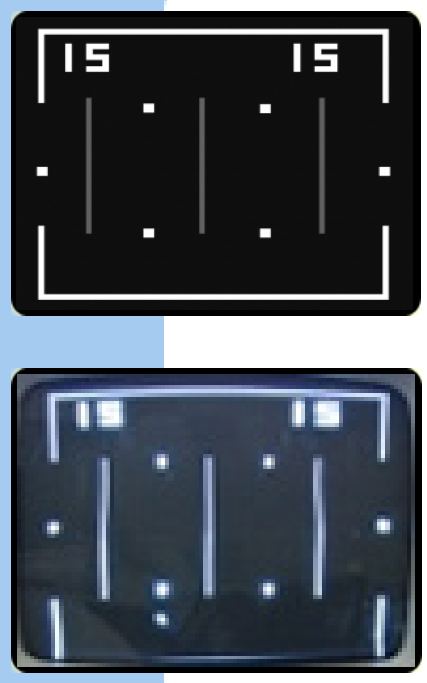
No Two Games Alike
Creates Repeat Play

Fun For All Ages

Record Profits
Already Proven On Location

Features
• 25c Play
• One or Two Can Play
• Large 16” Screen
• Real Live Sound Effects
• Service Free
• All Solid State
• Only Moving Parts Are Control Knobs and Coin-Rejector Cradle
• Dimensions; 25” x 29” x 46”

Soccer



Manufacturer *Ramtek*
Release *1973*
Class *Wide Release*
Genre *Ball and Paddle*
Soccer/Futbol
Mode *4 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Controls
Rotary: *Analog*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*
Upright/Standard

“Introducing $OCCER another money machine from the makers of VOLLEY & HOCKEY”

Soccer is basically a two team pong with a space in the outer box line for a goal. Can be played by 1- 4 players in competitive teams. The game features black and white raster graphics with a soccer themed cabinet.

“boardgamegeek.com”

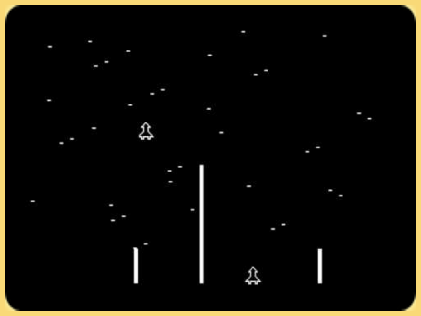
excerpt from the flyer:

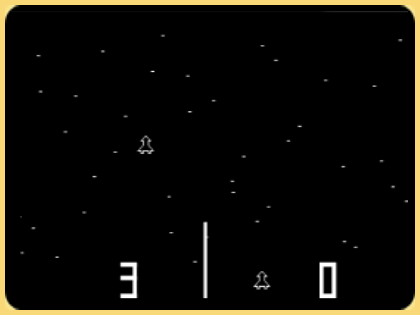
Here’s an action-packed video game that lets you cash in on the growing interest in European type soccer. Using the same designs that have made Ramtek’s “Volley” and “Hockey” overnight successes, Soccer will be even more profitable because it can be played by either two or fours players. This means more competitive involvement for increased replays.

Space Race

Manufacturer *Atari*
Release *1973*
Class *Wide Release*
Genre *Racing*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Controls
Joystick: *2-way (up, down)*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright Cocktail*

Space Race is an arcade game developed by Atari and released on July 16, 1973. It was the second game by the company after Pong (1972). Space Race was the first racing arcade video game and the first game with a goal of crossing the screen while avoiding obstacles.





Space Race is a two-player arcade game. In the game, the two players each control a spaceship, which they fly from the bottom of the screen to the top. Along the way are dashes representing asteroids moving across the screen from left to right, which the players must avoid. Movement controls are limited to moving the spaceship up or down; if the player's ship is hit by an asteroid it disappears for a few seconds before reappearing at the bottom again. The game displays a starfield in the background, as well as each player's score, which increases whenever a player makes it to the top first. Each game is for a set amount of time, represented by a line in the bottom middle of the screen that shortens during the game, with the winner being the player with the higher score when time runs out. Each game costs a quarter. Machines can be set to play one or two rounds per game, and the time per round is adjustable per machine over a range from 45 seconds to 3 minutes.

Development of Space Race began soon after the founding of Atari in Summer 1972 under the name Asteroid. Co-founders Nolan Bushnell and Ted Dabney had the initial idea for the game while developing the 1971 Computer Space, the first arcade video game, but felt the more complicated Computer Space was a better first game. After leaving Nutting Associates and founding Atari in May 1972, Bushnell spent a few days designing Asteroid, but soon had to drop the project to focus on running the company. After the release of Pong, Atari's first game, development resumed on the title in Spring 1973. Dabney has claimed credit for the game's final design, though Pong designer Allan Alcorn has stated that he and Bushnell may have been involved as well. Asteroid, codenamed VP-2, was designed to be a racing game that would be simple to create to fulfill an earlier contract with Bally Midway; Atari had initially offered Pong during its development to fulfill the contract, but had been rejected. The company was also interested in producing a very different game from their previous success, as they felt that innovative design was what would separate them from their competitors, which they saw as flooding the market with Pong clones rather than making new video games.

The engineering and prototyping for Asteroid was done by Alcorn. The game is encoded entirely in discrete electronic components, like Atari's earlier games, and unlike later computer-based arcade games; the graphics are all simple line elements with the exception of the spacecraft, which are generated based on diodes on the circuit board arranged in the shape of half of a ship to represent the shape they create. That half ship is mirrored on the screen, similar to the diode array in Computer Space, which generated eight directions of a rotating ship with a mirrored four images. The game was completed quickly, and

Alcorn soon moved on to Atari's third game, Gotcha. When the game was complete, the design was given to Midway to sell under that name, only for Atari to produce a nearly identical version itself titled Space Race, which was released on July 16, 1973.

A fibreglass Space Race cabinet was designed for the game by Atari's product designer, George Faraco. The tall, angular cabinet, reminiscent of the fibreglass cabinet for Computer Space, was the first to display the Atari logo. The cabinet design was distinctive enough that Bushnell considered using it for Pong as well, but the production costs proved too high and only 50 units were made before the design was dropped and Space Race switched to a more traditional rectangular cabinet. The final cabinet stands nearly 5 feet tall and weighs over 200 pounds. Bushnell later stated that the molds to make the fibreglass cabinets cost $2000 and could only make one per day due to the complicated shape, and Atari felt the cost did not justify buying enough moulds to make a full production run in a reasonable amount of time. The final Space Race cabinet was reused later that same year for Pong Doubles, a four-player version of Pong.

Space Race was not commercially successful; Nolan Bushnell has described it as "not as successful as Pong by a wide margin", and Ralph Baer claims that it sold around 1,500 units. It did inspire a clone game, Taito's 1973 Astro Race, and according to Bushnell also inspired an unsuccessful clone version by Nutting Associates. Midway felt that the release of Space Race violated their contract with Atari for Asteroid, and the two companies agreed in exchange to drop Atari's three percent royalty cut for Asteroid machines.

Despite Space Race's prominence as Atari's second game and the first after Pong, the 1973 arcade video game market was largely dominated by Pong clones; while Pong was the fourth arcade video game ever produced, Space Race was approximately the fourteenth, with nine Pong clones between them and mostly only other clones filling out the rest of the year's releases.

Space Race was the first arcade racing video game, as well as the first game with a goal of crossing the screen while avoiding obstacles, though a few racing games had been released in 1972 for the Magnavox Odyssey home video game console. Later games in that genre are the arcade game Frogger and the Atari 2600 Freeway, both from 1981. A similarly-titled, expanded version of Space Race was published by ANALOG Software in 1981 for the Atari 8-bit family of computers as Race in Space.

Prototype
Photo by: Greg McLemore

excerpt from the flyer:

Super space gamesmanship. Space ships race across the galaxy, dodging meteors and asteroids. Zap! Hit, they disintegrate, then another blasts off for another flight. Each successful trip through space earns an individual score. Totalizer records scores for competing ships. One player can race the clock or fly two ships for a high skill test. Two players can duel through the meteor storm competing for high score.

Great player appeal. New. Sophisticated. And fun.

Lots of visual action. Excellent clarity. Sharpest TV image.

Constant video action in attract mode demands play. Electronic space sounds are always beckoning, meteors are constantly moving, challenging the player to try his luck. They can't pass up this game.

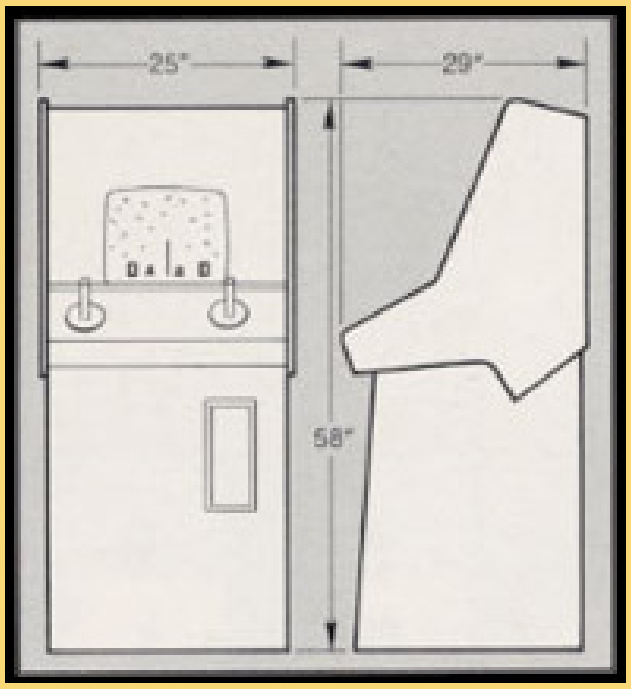
Skill and luck factors. Just enough frustration to encourage replay after replay.

Reliable. Solid state. "Durastress" computer with one year warranty. Repairs after initial warranty period are made for nominal cost. Major components tested to Mil. Spec. 883. Rugged console. Precision engineering. Designed and built by the originators of video game technology. This means less downtime for your customer, less headaches for you.

Easy to operate and service. Front access to major components and separately locked cash box.

Clean, contemporary look. Space Race can be played anywhere and everywhere. Fine shops. Restaurants. Waiting Rooms. Recreations areas. Reception lobbies. Offices.

Fast profit-maker. Game time owner-adjustable from 45 seconds to three minutes. Two plays for 25c at the flip of a switch.



Dimensions. Height: 58" width: 25"; depth: 29"; weight: 217 lbs.

Space Race. Another winner from Atari, the reliable leader in video games.

Space Race PCB

"We've teamed up
And You'll own a champ"

Super Soccer is a black and white soccer game where each player controls three paddles to bounce the ball back and forth.

Super Soccer

Manufacturer *Allied Leisure Industries*
Release *1973*
Class *Wide Release*
Genre *Soccer/Futbol*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Controls
Rotary: *Analog*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

T.V. Tennis

Manufacturer *Nutting Associates*
Release *1973*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *4 Players simultaneous*
Gameplay *Either*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Controls
Rotary: *Analog*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

The gameplay is like the original ball and paddle game. Which ever side won the last point serves. The first person or doubles team to 15 points wins.

The lower sides and front of the cabinet are a dark wood grain laminate. The upper sides and front are an off-white wood grain laminate. The control panel is an off-white rough textured laminate. A dark tinted plexiglass sheet with painted-on graphics and instructions covers the monitor.

"arcade-museum.com"

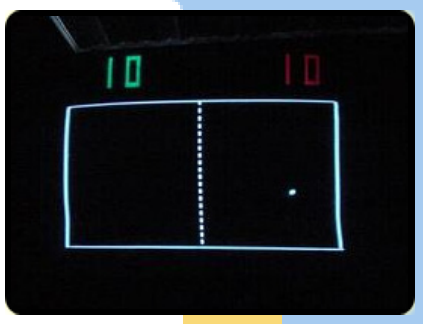
excerpt from the flyer:

"Styled & Built for Durability"

- 1 Coin - 2 Players
- 2 Coins - 4 Players
- All Solid Formica Cabinet
- Isolated Locket Cash Box
- Positive Stops on Control Knobs to Provide Long Life for Potentionmeters.
- Large Screen 100% Solid State TV and Tilt-Back Cabinet Design Permit Easy Play and Spectator Visibility.
- Court Lines on Top and Bottom.
- Start Button to Eliminate Instant Service.
- Easy Serviceability and Access to All Parts.

Table Tennis

Manufacturer *Nutting Associates*
Release *1973*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *4 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Controls
Rotary: *Analog*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Cocktail*



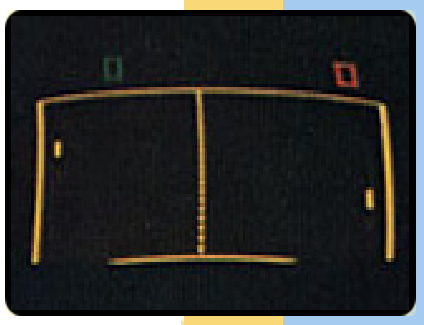


Table Tennis is a two- to four-player game with a ball bouncing from side-to-side off the borders of the screen. The object of the game is to try to out-maneuver the other player's paddle and score a point.

excerpt from the flyer:

"From Nutting Associates
-Where video game technology began..."

Table Tennis is our new video action game. Its unique combination of special features makes it better than any coin video game yet devised - for the operator, for the player, and for the location owner.

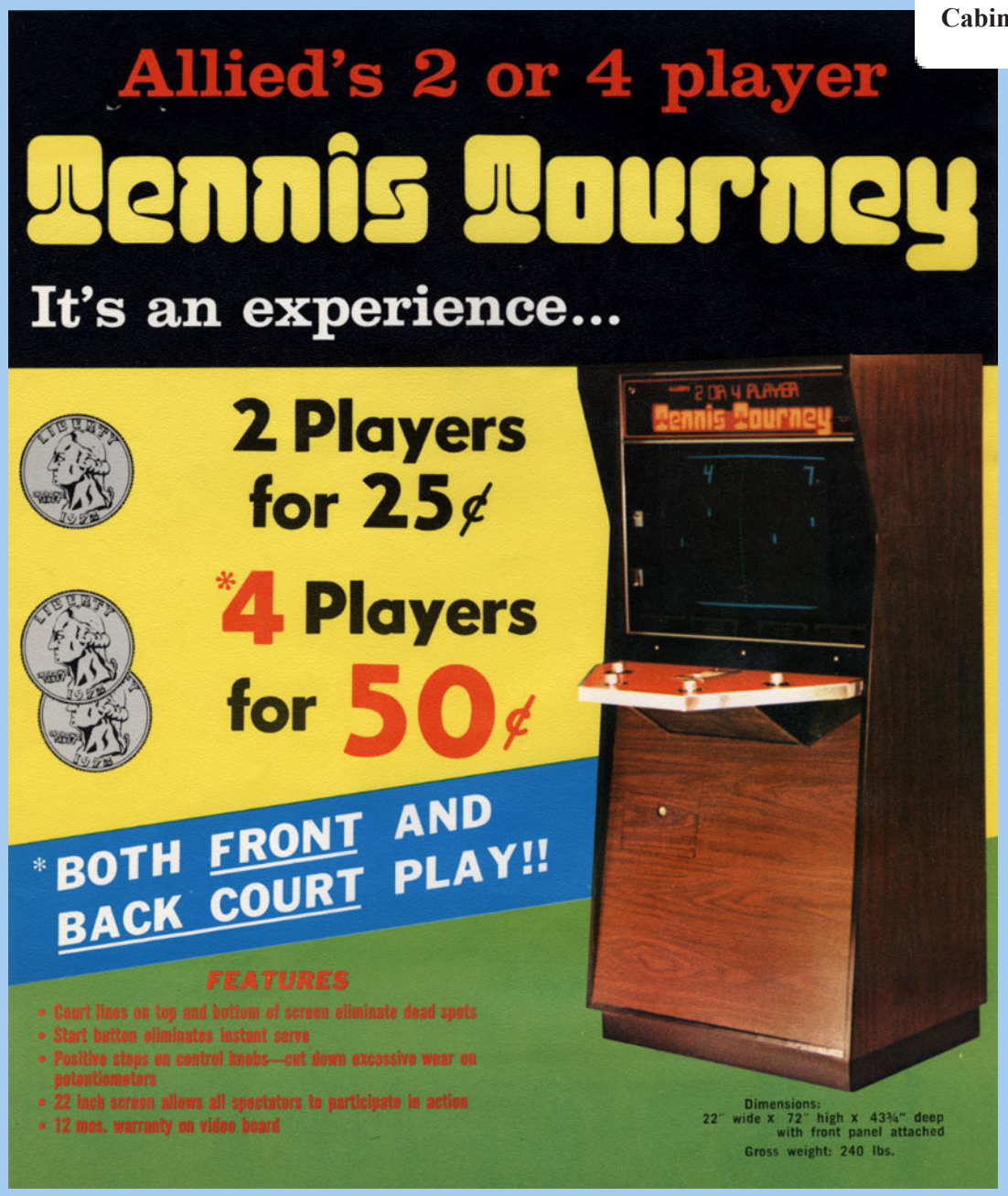
It's housed in a handsome and contemporary cabinet that's actually a durable and attractive piece of furniture. This feature make Table Tennis ideally suited for sophisticated lounges, country clubs and other entertainment spots.

Functionally, Table Tennis is an exciting 1-, 2- or 4-player game with an electronically controlled "ball" bouncing from side to side of the four borders of the screen and across a "net." Object of the game is just like real table tennis - to outmanoeuvre the other player's paddle and collect points.

Tennis Tourney is a two- to four-player tennis game from Allied Leisure.

Tennis Tourney

Manufacturer *Allied Leisure Industries*
Release *1972*
Class *Wide Release*
Genre *Sports*
Mode *4 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Controls
Rotary: *Analog*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*



TV Hockey

Manufacturer *Chicago Coin Machine Co.*
Release *1973*
Cabinet Styles *Upright*

TV Hockey was produced by Chicago Coin Machine Co. in 1973.

No pictures or other information was found on this machine...

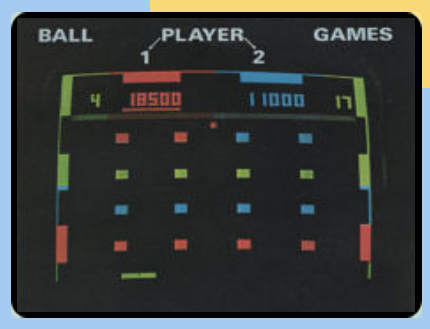
TV Pin Game

Manufacturer *Chicago Coin*
Release *1973*
Class *Wide Release*
Genre *Video Pinball*
Mode *2 Players*
Gameplay *Alternating*
Panel Layout *Single Player*
Hardware *Discrete Logic*
Controls
Rotary: *Analog*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White with a Color Overlay*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

CHICAGO COIN'S TV PIN GAME

TV Pin Game is a digital version of pinball, which use a vertical playfield with a paddle at the bottom of the screen, controlled by a rotary dial. The game space, like pinball, is filled with obstacles, bumpers, and pockets along the side, represented by simple squares. The game also include a moving rectangle at the top of the playfield which serve as a skill shot. Other manufacturers quickly picked up digital pinball as well: Midway with TV Flipper, Exidy with with TV Pinball, and Atari with Ping Pong, which digitally represented flippers controlled by buttons, rather than a paddle and rotary dial.

"History of Digital Games: Developments in Art, Design and Interaction"



excerpt from the flyer:

"It's the industry's most revolutionary new game."

Let TV PINGAME start gathering crowds for you. It's a game with long and lasting drawing power! From start to finish, it was designed with the operator in mind.

• ADJUSTABLE for free game or extra ball.
• 25¢ play. Adjustable for two games 25¢. Also three games for two quarters.
• 5 BALLS - adjustable to three balls per game.
• GAME constantly play itself to attract attention when not in use.
• COMPACT cabinet.
• TV PINGAME can be operated anywhere, even in locations where pin balls are not.
• BALL changes speed and directions. No two games play alike - just like regulation flipper game.
• FLIPPER horizontally controlled, rebound ball right, left, or straight up.
• 16 BUMPERS. Knock them out and score 100 points each. Knock them all out for a bonus of 8000 points. Game continues with 16 new bumpers.
• 9 POCKETS. Hit pockets and score 100 points or lose ball in lower corner pockets.
• MOVING TARGET moves across top of screen. Hit it and score 2000 points.
• BALL COUNT and GAME CREDITS, as well as DIGITAL SCORES, displayed on screen.
• SIGHT - game in full color. Unique color overlay on standard TV screen.
• SOUND - has real chimes plus realistic pin ball electronic sounds.

DIMENSIONS:
Height: 61" Width: 23"
Depth: 24" Weight: 225 lbs.

TV Ping Pong

Manufacturer *Chicago Coin*
Release *1973*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *4 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Controls
Rotary: *Analog*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

TV/PING PONG

TV Ping Pong is one of many variations on the "ping pong" gameplay. Two players compete in volleying a ball across the screen by moving paddles up and down along the sides of the screen. The first player to 11 (or 15) wins.

TV Ping Pong is a very simple cabinet where the monitor glass and marquee are cream colored with red and yellow lettering. The control panel is a metal plate with the directions silk-screened onto it. The sides of the cabinet are fake-wood vinyl veneer and the front of the cabinet is painted yellow and orange.

There are no processor or graphics ICs on the board. The power supply is a simple transformer and the rotary controls are 5K Ohm potentiometers. The monitor is just a B&W television that recieves its video signal through its VHF and UHF antenna inputs.

"arcade-museum.com"

TV Ping Pong

Manufacturer *Amutronics*
Release *1973*
Class *Wide Release*
Genre *Ball and Paddle*
Monitor
Orientation: *Horizontal*
Cabinet Styles *Upright*

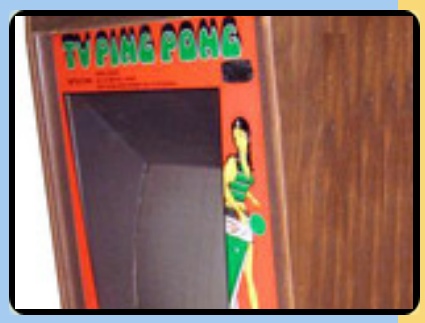
TV Ping Pong is a Pong clone by Amutronics of Cherry Hill, NJ. The player uses a rotary knob to control an onscreen paddle, moving it vertically to hit a ball travelling horizontally across the screen. Players can compete against a computer controlled opponent or another player controlling a second paddle to score the most points.

excerpt from the flyer:

"Exciting where it counts - in the cash box"

- 25c Play
- Competitive 2 Player Action
- Reliable Solid State Mechanism
- Sound Effects
- Appealing to Players of All Ages
- Acceptable for All Types of Locations
- Front & Back Cabinet Accessibility

Dimensions:
Height - 62"
Width - 25"
Depth - 23 1/2"
117 V. - 60 Hz
Shipping Weight - 200



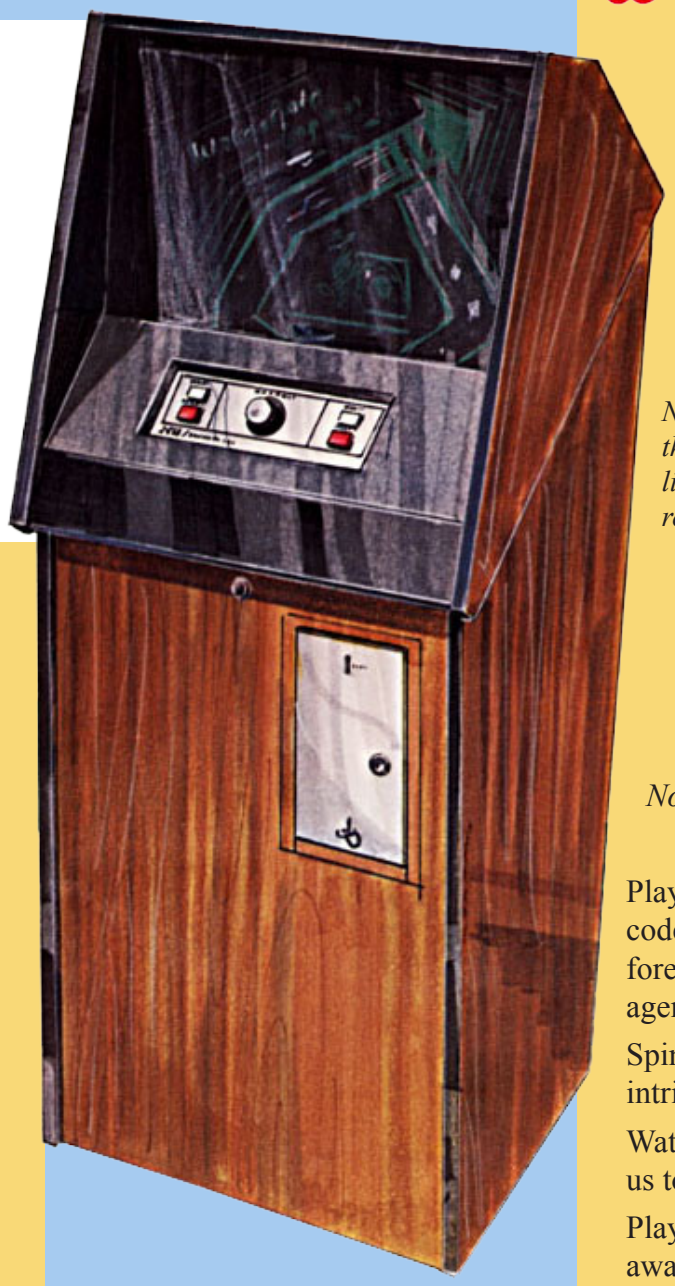
Volly

Manufacturer *Ramtek*
Release *1973*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *2 Players simultaneous*
Gameplay *Joint*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Controls
Rotary: *Analog*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Video tennis game (like Pong) where player 1 is on the left and player 2 is on the right. First player to reach 15 points wins. Ball serves automatically and game starts as soon as coin is inserted.

Watergate Caper

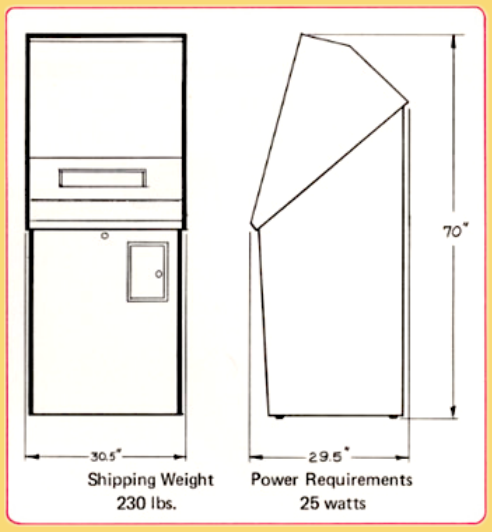
Manufacturer *Nutting Associates*
Release *1973*
Mode *1 Player*
Gameplay *Single*
Panel Layout *Single Player*
Hardware *Discrete Logic*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*



The major news story of 1973 was the ongoing Watergate investigation and Nutting attempted to cash in with Watergate Caper. Introduced at the 1973 MOA show, the game invited players to "discover the secret combination and break into the Watergate yourself." In the game, the player feverishly twists the dial and punches the code key to reveal a mysterious combination before time runs out and he is caught by double agents.

Though it is often listed as a video game, its flyer makes no mention of a TV monitor and it may have been an electro-mechanical game along the lines of Milwaukee Coin Industries The Safe. Video game or not, it stands as a rare example of an arcade game based on a political scandal.

"allincolorforaquarter.blogspot.no"



Watergate caper

Nutting Associate's Watergate Caper game is the topic of discussion among Nutting's William G. Nutting (left), and Musical Sales representatives (from left to right) Tommy Trokey, Stan Seifer, and Sam Massaro

excerpt from the flyer:

You Watched It On TV
You Read About It In Papers
Now - Discover The Secret Combination And
Break Into The Watergate Yourself

Player feverishly twists the dial and punches the code key to reveal a mysterious combination before time runs out and he is caught by double agents.

Spine chilling sound effects create suspense and intrigue. Eerie black light adds to the mystery.

Watergate Caper stimulates the larceny in all of us to see if we can break in and not get caught.

Players try again and again to see if they can get away with it.

FEATURES

- **25c play -**
- **EZService cabinet** - all collecting, servicing and adjustments are easily and quickly accomplished from the front
- **Instafix modular circuitry** - makes field repairs fast and simple
- **MaxiSafe coin box** - locked, heavy gauge steel box protects collections
- **Adjustable game** - 1 to 3 minutes
- **Extended play** - for Super Agent Score
- **Lamp test** - one switch lights all lamps simultaneously for easy burn-out check.

Wimbeldon

Manufacturer	*Nutting Associates*
Release	*1973*
Genre	*Sports*
Hardware	*Discrete Logic*
Cabinet Styles	*Upright*

Wimbledon is a four-player tennis game that used distinctive slider controls in place of the standard rotary controls or joysticks. What made the games interesting, however, was not the controls but the graphics. They were among the earliest games to use computer-generated color rather than the cellophane overlays found in other games. Wimbledon was designed by Miel Domis. Domis was tasked with designing a color version of Pong. Wimbledon debuted at the 1973 MOA show in November and its release was announced in the December issues of Vending Times and Cash Box. Though the game was billed as the first arcade video game to use real color, Atari's Color Gotcha probably preceded it by about a month. Wimbledon, however, was in all likelihood the second true-color video game and it is possible that it beat Color Gotcha to market.

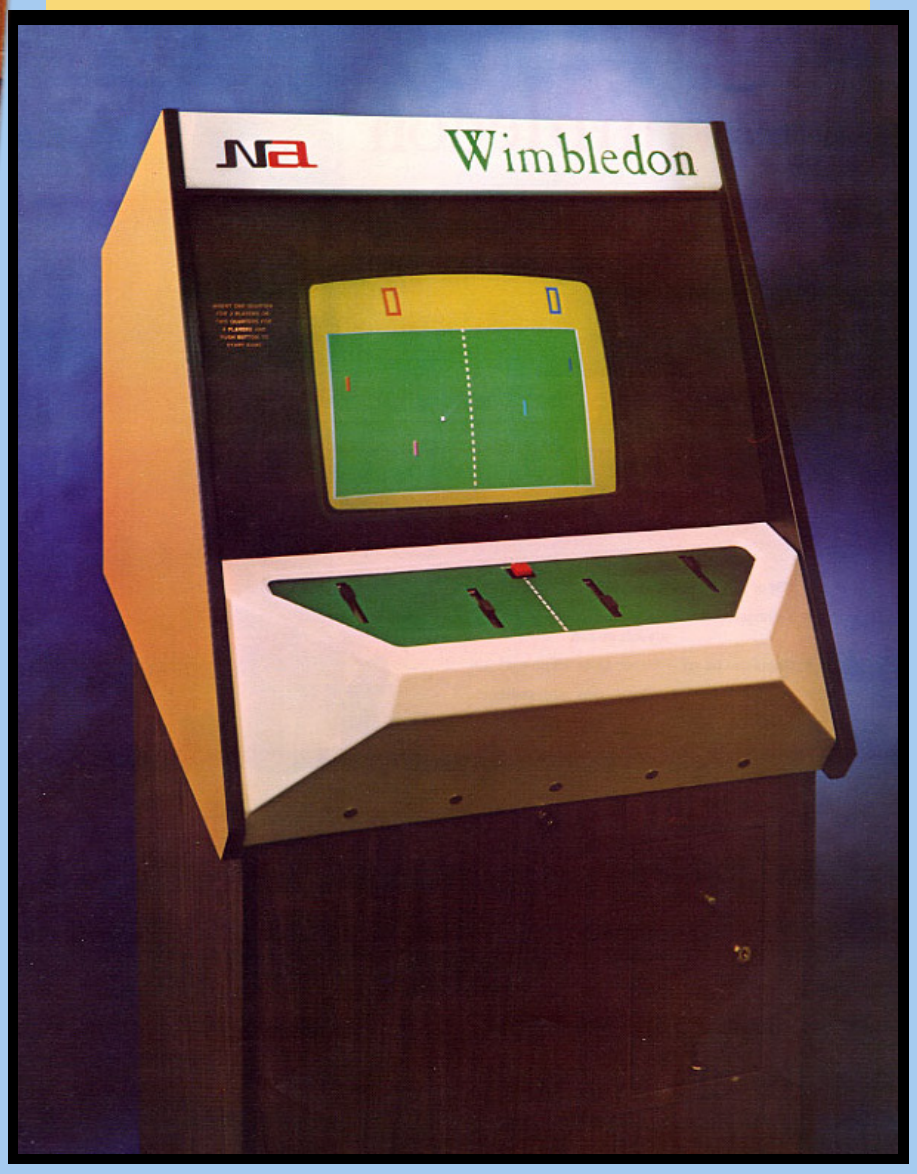
"allincolorforaquarter.blogspot.no"

excerpt from the flyer:

- Living-color TV
- Giant color screen instantly attracts more players
- Green lawn court
- White border lines
- Each paddle has its own color

FEATURES

- **25c or 50c play -**
- **Adjustable** - From 2 players at 25c to 4 players at 25c
- **Game can be set** - Either 11 or 15 points
- **Reliable color TV** - Solid-state, with stable color circuitry - One full year warranty.



Winner

Manufacturer *Midway Manufacturing Co.*
Release *1973*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Controls
Rotary: *Analog*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Special Sound System*
Sound From Television
Cabinet Styles *Upright*

Winner is a Pong clone that was the first arcade game manufactured by Midway. One credit pits players against another opponent in a Ping Pong type battle.

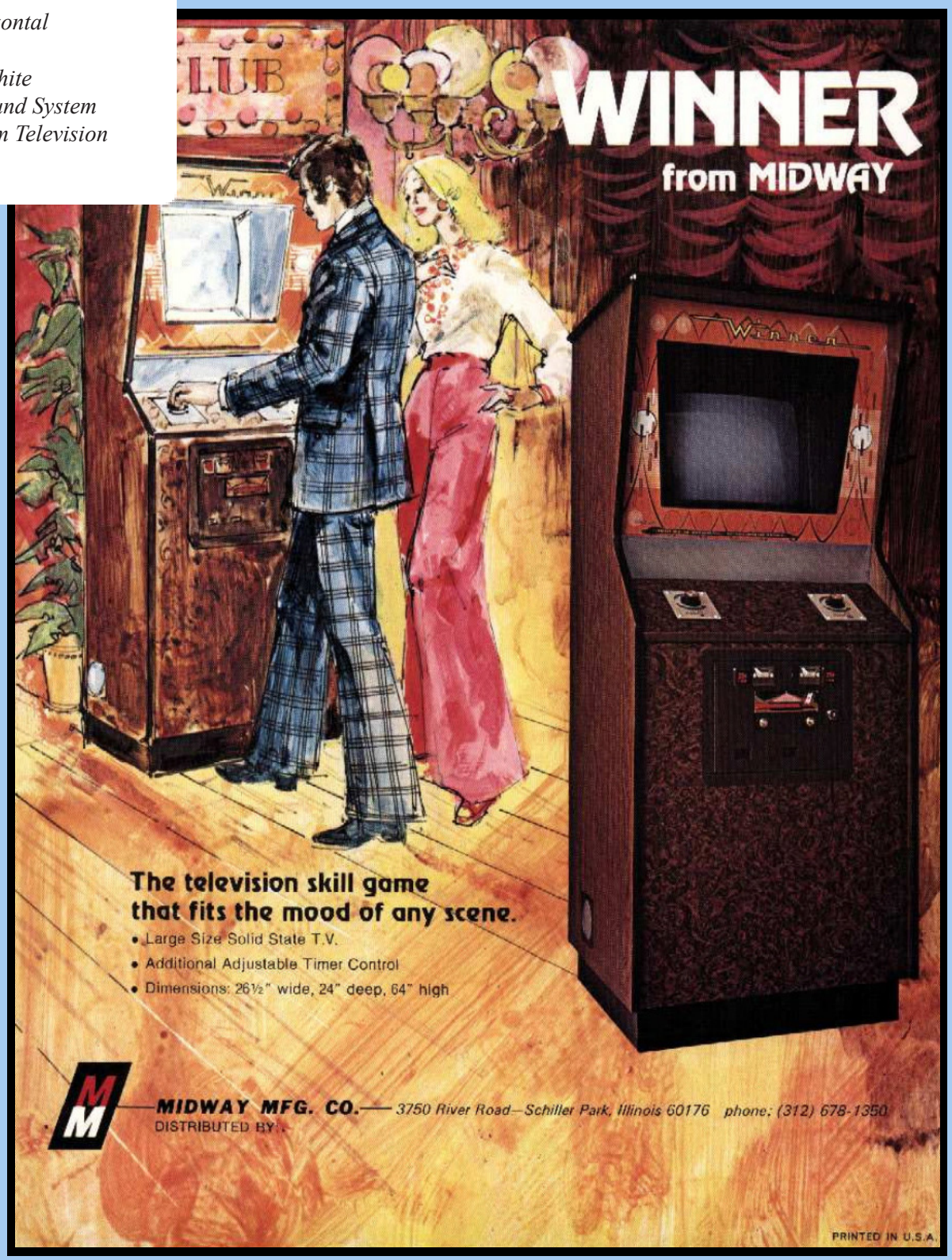
excerpt from the flyer:

Midway's new table tennis game, WINNER, will be in your distributor's showroom soon. This game is being built under license and with the co-operation of Atari, Inc., of Santa Clara, California, (Syzgy Engineered), the inventor and developer of the game.

Midway has reaped the benefits of months of location testing. WINNER lends itself to the sophisticated atmosphere of all locations. This unit has extra circuitry to allow the audience to view the match play on the location's television set, if desired.

The fascinating, competitive play has caught the eye of every age group, and has made it the most exciting game of the decade.

The outside dimensions are 26 1/2" wide x 23 7/8" deep x 64" high.



Winner II

Manufacturer: *Midway Manufacturing Co.*
Release *1973*
Class: *Wide Release*
Genre: *Ball and Paddle*
Hardware *Discrete Logic*
Cabinet Styles *Upright*

Winner II is a Table Tennis game. Players hit a ball back and forth across the screen using their paddles. Failing to return the ball awards a point to the other player.

Winner IV

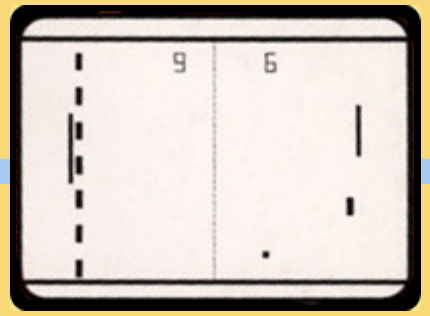
Manufacturer *Midway Manufacturing Co.*
Release *1973*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *4 Players simultaneous*
Gameplay *Either*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Controls
Rotary: *Analog*
Rotary: *Analog*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Up to four people can play. Two players on one side bat a ball to the other side where it is fielded by the other two players. Players can even play one-on-one if they are ambidextrous.

Astro Hockey

Manufacturer *Brunswick*
Release *1973/1974*
Class *Wide Release*
Genre *Sports*
Hardware *Discrete logic*
Cabinet Styles *Upright*

Astro Hockey was produced by Brunswick in October 1974. The game is an early hockey videogame with four game variations.



excerpt from the flyer:

"With four exciting game variations for greater player appeal and more profit potential!"

1. Player vs. player
2. Player vs. player with speed and direction change at center line.
3. Player vs. machine.
4. Player vs. machine with speed and direction change at cenet line.

Astrohockey

Manufacturer *HID/Visco Games*
Release *1974*
Class *Wide Release*
Genre *Sports*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Hardware *Discrete Logic*
Panel Layout *Multiple Player*
Controls
Rotary: *Analog*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Astrohockey, produced by HID/Visco Games in 1974, is a black-and-white hockey game.

No pictures or other information was found on this machine...

Attack UFO

Manufacturer *Taito*
Release *1974*
Mode *2 Players simultaneous*
Gameplay *Either*
Hardware *Discrete Logic*
Panel Layout *Multiple Player*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

UFO Attack is a black and white game with UFOs.

The game is thought to be the original of Electra Games' UFO Chase (1975).

Basketball by Taito

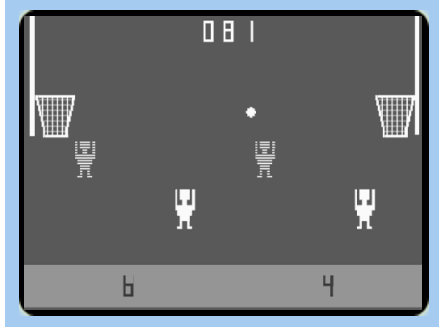
TV Basketball by Midway

Basketball

Manufacturer *Taito*
Release *1974*
Class *Wide Release*
Genre *Sports*
Mode *2 Players simultaneous*
Gameplay *Joint*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Released in the arcades in early 1974, Basketball was a landmark title, notable for several firsts in video gaming. It was the first basketball video game, the first video game to use sprites, and the first to represent human characters. It was also the first Japanese video game licensed for release in North America, having been developed by Taito and then licensed to Midway for the North American market, where 1,400 units were sold in 1974, a production record for Midway at the time. Its success paved the way for more Taito hits licensed by Midway.

"giantbomb.com"



excerpt from the flyer:

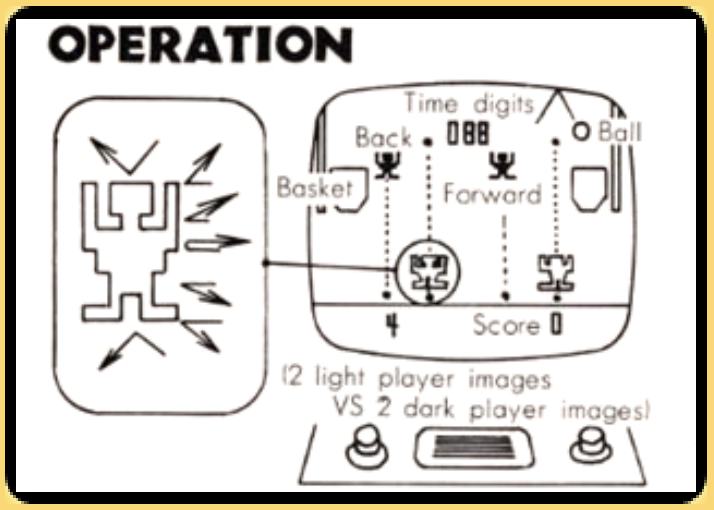
"TV Game with real and exciting Basketball action."

HOW TO PLAY

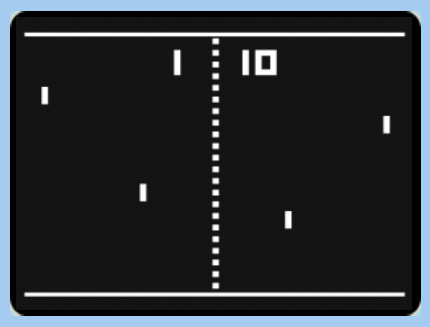
1. Insert coin. Player images (two each forward and back), ball and baskets (goals) appear on the screen.
2. Player images can be moved up or down by manipulation of the front panel control knob.
3. Players scores 2 points for each basket (goal). Player also can dribble and pass before shooting. All the skills of real Basketball are needed for TAITO BASKETBALL.
4. Push the replay button (left side of coin slot) to start the second game.

FEATURES

- Two player game.
- The totally different, new sixth T.V. game from Taitronics series.
- All reliable solid-state components and large 20-inch television screen.
- IC circuit for coin credit unit
- Realistic player images and baskets (goals).
- The changing digits on the center top of the screen indicate the time elapsed. This timer is adjustable.



Challenge



Manufacturer *Mirco*
Release *1974*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *4 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Rotary: *Analog*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright Cocktail*

"Challenge -
The Table top video with the free game."

In March, 1974 Mirco introduced Challenge, an upright four-player game that offered a free game to players who beat the computer in player-versus-machine mode. While Mirco claimed it was the first video game to offer such a feature (likely a false claim), it wasn't enough to cover for the fact that Challenge was another uninspired game (not to mention that four-player games had already been on the market for at least eight months).

"allincolorforaquarter.blogspot.no"

excerpt from the flyer:

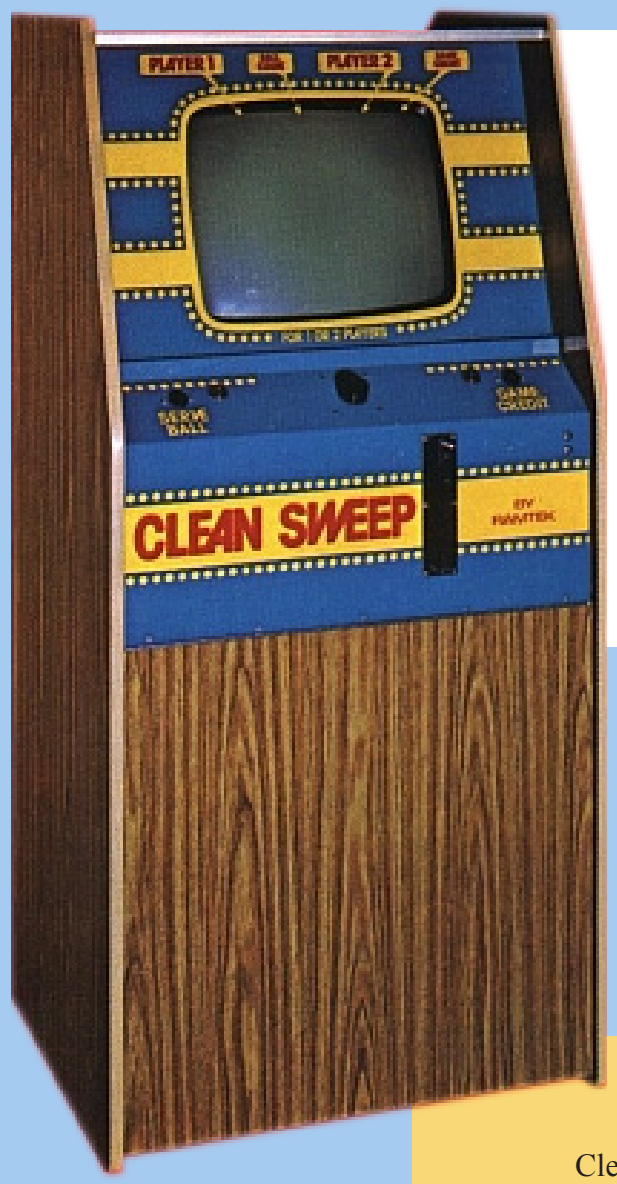
The initial reaction to our top video has been exceptional.

High earnings and continuous play have been the experience of operators all across the country.

(1) **Playabillity** Our machine is a 1-2-4-player. The extended play option, where one or two players can beat the machine and win a FREE GAME insures a continuous cash flow.

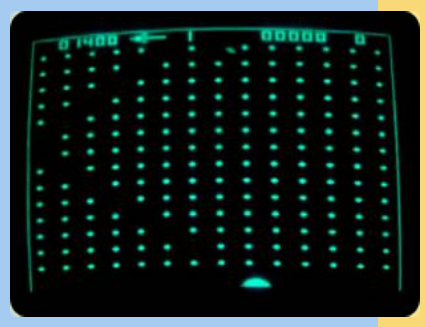
(2) **Reliability** Microm Inc., the parent company of Micro Games, Inc. is known worldwide for the testing of Printed Circuitry. The thorough analysis we conduct for certain broad based computer industries is conducted on our video games. A 144 hour complete system power cycle analysis in conjunction with a voltage margin checkout insures continued reliability.

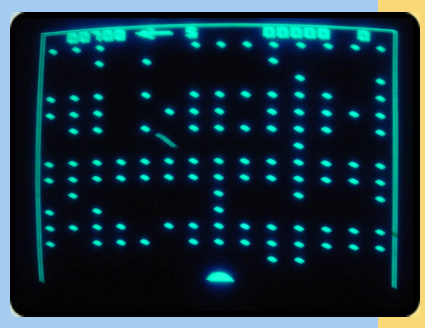
Dimensions: 27" high 33" diameter
Wt. 170 lbs.



Clean Sweep

Manufacturer *Ramtek*
Release *1974*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *4 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Rotary: *Analog*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*



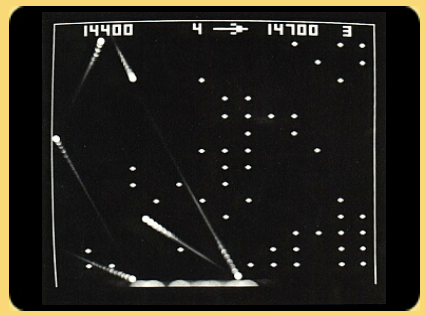


Clean Sweep, created by Howell Ivy, is a competitive ball and paddle game from Ramtek.

In Clean Sweep, players control a paddle at the bottom of the screen and hit a ball into a field of dots. The field of dots are arranged as a 14x14 grid and each time the ball hits a dot it disappears and the player earns points to their score, The ball will keep going in the direction its shot until it ricochets off the sides or top of the screen and returns back to the bottom of the screen where the player either hits it back up into the field of dots or misses the falling ball and loses a ball. Players are given a total of three or five balls depending on the setting. The goal of the game is to clear all of the dots and get a clean sweep. Some see the game as a kind of primi-tive predecessor to Atari's Breakout.

"mobygames.com"

"First one or two player video game with true "Pinball" action from the makers of Hockey, Soccer & Volley"



excerpt from the flyer:

Clean Sweep is a major, money-making breakthrough in coin-operated video games because it can be played by one or two people, can be set to award free games for high scores and allows either 3 or 5 balls for each player. The number of balls and the free game award are both operator-selectable. Players try to erase a field of dots by directing a bouncing ball with a joystick-controlled "paddle" that is moved horizontally across the bottom of the screen. Each time the ball passes over a dot, the dot gets erased and the player gets a point. If he erases all the dots, he scores a "clean sweep" and can win a free game. No other video game matches the fast action and player challenges of "Clean Sweep." Put it in your best locastions and sweep in bigger profits.

• 25¢ and 50¢ play produces high profit per square foot of floor space.
• Can be played by one or two players.
• Attractive, eye-catching cabinet.
• All solid state for low maintenance and long life.
• Commercial quality TV monitor insures reliability.
• One year logic board warranty.
• Engineered interior design prevents tampering, simplifies service.

UNEQUALED SERVICE

Ramtek video games are backed by the most responsive service in the industry. When repairs are needed, they're done fast. And new logic boards can be in the air within 24 hours. When it comes to service Ramtek doesn't play games.

Countdown

Manufacturer *Volley*
Release *1974*
Class *Wide Release*
Class *Ball and Paddle*
Mode *4 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Controls
Rotary: *Analog*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Cocktail*

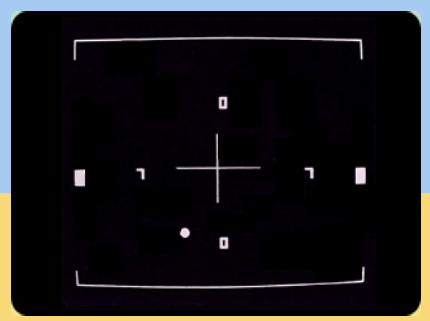
Countdown is a competitive game of elimination where players try to send the ball to any of the opponents goals.

The game is for 2 or 4 Players, it has a black & white display and uses 4 Paddles Knobs (on the control panels). Each player starts with 5 points, and loses a point every time he allows a goal. When he's down to zero, he's out of the game. But the game goes on with the remaining players, until there's only the winner left.

Club Tennis

Manufacturer *Computer Games Inc.*
Release *1974*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *4 Players*
Gameplay *Team*
Panel Layout *Multiple Player*
Hardware *Discrete logic*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Club Tennis is a Pong clone. Either 2 or 4 players can play at a time. A 2 player game was priced at 25 cents, and a 4 player game was priced at 50 cents. Start button eliminates install ball serving.



excerpt from the flyer:

"The new sophisticated game of elimination for 2 or 4 players."

Countdown, like all VOLLY games, is built in Canada, with the kind of quality you expect from a reputable Canadian manufacturer. And of course, being right here in Canada makes it easier for us to supply you with parts - we always keep a full supply handy, and are geared to rush them to distributors - usually the same day requested.

MODULAR DESIGN
Each major component is a self-contained module which can be removed and replaced in minutes. Repairs are simple, quick and inexpensive, down-town is minimal, and very little technical expertise is required.

TESTING PROCEDURES
Any game that leaves VOLLY'S premises has been fully tested - circuitry has been subjected to stand-alone burn-in testing, and finished games to both a high voltage (dielectric strength) test and a 48 hour burn-in. You can be sure of this - when a game leaves our factory, it's safe and it works.

Each player starts with 5 points, and loses a point every time he allows a goal. When he's down to zero, he's out of the game. But the game goes on with the remaining players... until there's only one player left - the winner! COUNTDOWN can be played by 4 players (50¢) or 2 (25¢). Its sophisticated styling makes it a welcome attraction anywhere. COUNTDOWN is built in Canada and fully backed by...

The Canadian name in amusement games
VOLLY INDUSTRIES LTD.

Coup Franc

Manufacturer	*Volley*
Release	*1974*
Class	*Wide Release*
Genre	*Sports*
Hardware	*Atari Discrete logic*
Sound	*Amplified Mono (one channel*
Cabinet Styles	*Cocktail*

Coup Franc is the first game from Atari Europe division. It is also the 1st game on a cocktail table before QuadraPong. The first versions of this tables were available with Coup franc and few weeks later the 2nd versions were available with Quadra Pong.

The game seems to be similar (or identical) to the Coupe du Monde Cocktail. According to Discrete Logistics, it is a cocktail version of Coupe du Monde. The cocktail cabinet, appears on the flyer to have a color overlay. A candidate for one of the first cocktail cabinets ever made.

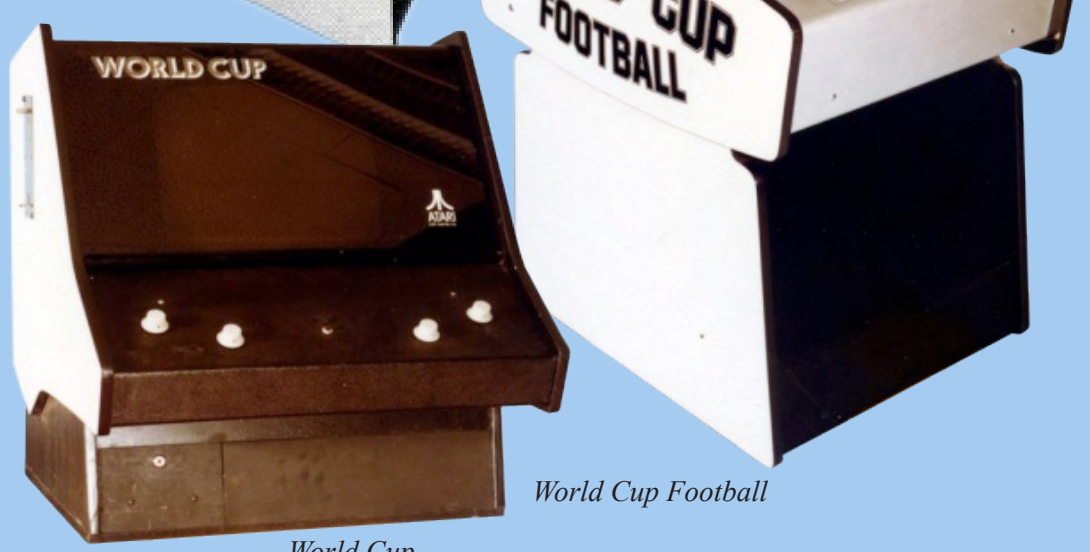
According to 8bitrocket.com Coup Franc is a sequel to Coupe Davis. With the flyer as an example, seems to have been released near Quadrapong. Also, according to this source it is a sequel to Pong Doubles.

"mamedev.emulab.it"

Coupe Du Monde

Manufacturer *Atari*
Release *1974*
Class *Wide Release*
Genre *Sports*
Hardware *Atari Discrete logic*
Sound *Amplified Mono (one channel*
Cabinet Styles *Upright Cocktail*

Coupe du Monde



World Cup Football

World Cup

Crazyfoot

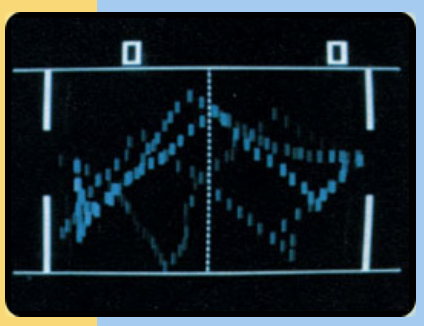
Manufacturer *Midway Manufacturing Co.*
Release *1974*
Class *Wide Release*
Genre *Sports*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Rotary: *4-way (up, down, left, right)*
Hardware *Discrete Logic*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

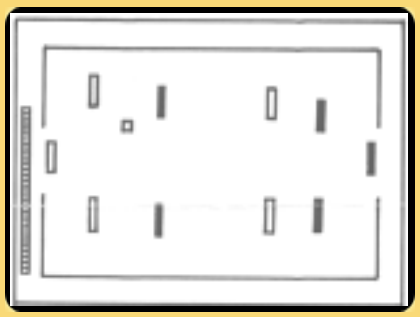
Crazyfoot is a black and white soccer themed pong-like game where players use joysticks to hit the ball back and forth and try to knock into the opposing goal.

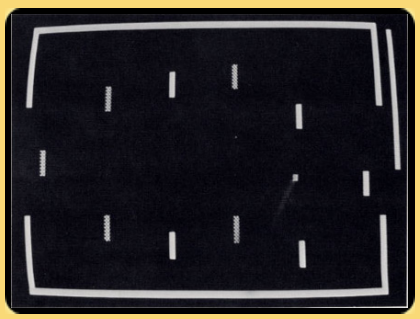
excerpt from the flyer:

a tv - football - topper!

- Total free paddle movement over both halves of playfield
- Exciting goal features for boasting experts
- Gradually accelerating ball speed
- Realistic moments of scoring action
- Flashing ball reappearances after each goal







Coup du Monde is the Atari France release of World Cup Cocktail. Release date is the same as Atari's April 30, 1974.

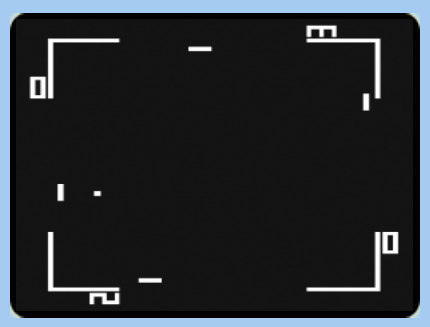
The discrete logistics claims this game is identical to Coup Franc.

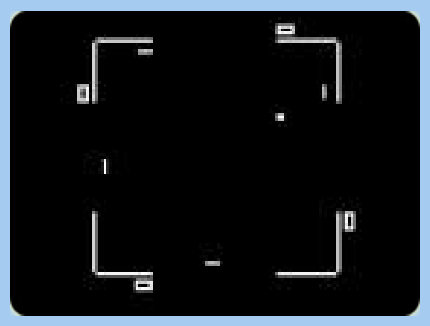
The game is also known as Soccer Cocktail, Pelé Soccer Cocktail, World Cup Football Cocktail. Cocktail version of World Cup. The game may have been cloned later as Goal IV.

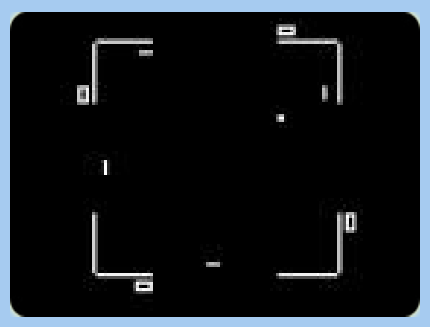
"mamedev.emulab.it"

Elimination/ Quadrapong

Manufacturer *Atari*
Release *1974*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *4 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Rotary: *Analog*
Hardware *Discrete Logic*
Monitor
Orientation: *Either*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Unamplified Mono (requires one-channel amp)*
Cabinet Styles *Cocktail*







Elimination!, better known by its Atari name Quadrapong, is the third official Pong game. Like Pong Doubles, up to 4 players can participate. The court is a square with an opening in each wall. A ball ricochets around the square, and each player must manipulate their paddle to protect their opening. Each player has a set number of misses, and after the ball passes through a player's opening four times, that player's opening closes and their paddle disappears, therefore they are "eliminated." The last player to have an open wall wins.

"mobygames.com"

The Quadrapong cabinet is in a waist high, all white enclosure with arched plastic/glass top that is tinted black.

excerpt from the flyer:

Another video action favourite! QUADRAPONG is the newest addition to Atari's unique line of video skill games. It's a sensational **4-player** game with a video ball bouncing from side-to-side off the four walls of the screen trying to penetrate each player's goal. A beeping sound simulates its rebounds and adds to the overall excitement. Each player tries to keep the ball out of his goal with a moving "paddle." If the ball penetrates his goal, he loses one of four points with which he begins the game. When all are gone, his goal closes. Players are eliminated until only the victor is left. Both sound and frenetic action challenge players to do it again... it's a truly irresistible game!

QUADRAPONG's exciting new table top desing takes up less space... its low profile allows room for 4 players and a congenial group of spectators. QUADRAPONG can be placed anywhere because of its clean, contemporary look, from fine shops to restaurants, waiting rooms, reception areas and offices.

Flim-Flam

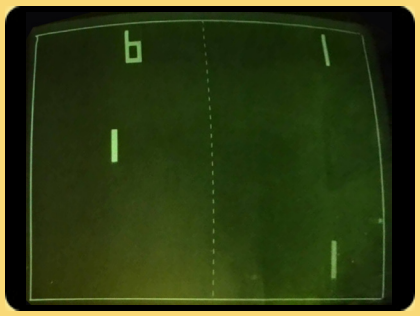
Manufacturer *Meadows Games*
Release *1974*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Controls
Rotary: *Analog*
Buttons: *1*
[Flim-Flam (Speed Control)]
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White with a Color Overlay*
A green overlay covers the screen.
Sound *Unamplified Mono*
(requires one-channel amp)
Cabinet Styles *Upright*
Cocktail

Flim-Flam is a head-to-head table tennis game. The first player to score twelve points wins. A joystick controls the paddle on the screen.

excerpt from the flyer:

Now your customers can have the longest lived video game in the history of the industry in a beautiful new cocktail table. No need to discourage business with that “arcade” look - the elegant simplicity of this new cocktail table is ideal for even the most sophisticated of environments. Now you can let a proven profit-maker work for you in airports, hotel lounges and restaurants.

Our padded simulated-leather pedestal suits your plusher locations while rich walnut-grained formica table top prevents scratching so your game always looks good. A tinted scratch-resistant plexiglass panel reduces monitor glare for a more apperance. Non-removable push buttons, ultra-reliable joysticks with cermet ports and a sealed reinforced table top keep this game up after the others go down.



The exclusive features of FLIM FLAM F1 always bring your customers back for more because... by selecting a comfortable paddle size the game is never too hard or too easy... multi-directional paddles permit movement anywhere in the player’s court so he can rush the net or hit the ball several times... the famous Flim Flam button changes the ball speed and angle to realy keep players on their toes... a new and more interesting attract mode flashes special lamps when not in play... the large 19” TV monitor with glowing green court boundaries means high visibility, higher profits.

We designed the cabinet with super-serviceability in mind. A hinged, lighted coin door means fast access to the coin acceptor, even in dark locations. The entire top swings away to expose the joysticks, TV monitor controls and all logic board adjustments. A separately looking cash box means you service-man and collector don’t need to share the same keys.

“Joy-Stick” control allows player Horizontal and Angular, as well as vertical control of paddle. Players can rush the net, miss the ball, retreat and attempt second hit. Ball may also be hit two or three times on each side of net.

“Flim” and “Flam” activator buttons allow player to alter speed and course of ball. Used with “Joy-Stick” control allows every player to develop his own unique playing strategy.

Three paddle sizes. As skill of players increase, paddle size selection can be reduced by choosing either “Expert” or “Pro” sizes. This helps prolong interest and play in two ways.

Fun Four

Manufacturer *Bailey International Inc.*
Release *1974*
Class *Wide Release*
Class *Ball and Paddle*
Mode *4 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Rotary: *Analog*
Hardware *Discrete Logic*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Unamplified Mono (requires one-channel amp)*
Cabinet Styles *Cocktail*

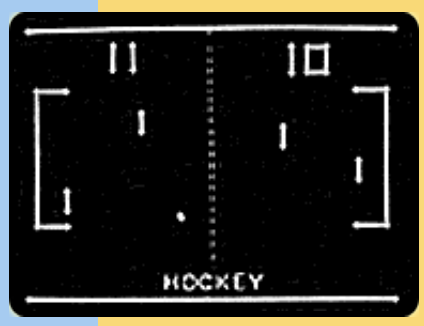
"16 exciting play fields"

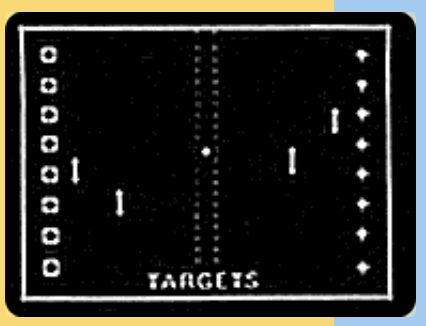
Fun Four feature four selectable games are Targets, Soccer, Hockey and Tennis.

excerpt from the flyer:

FEATURES
• 1-2-4 Players
• Free Game Option
• One Piece Logic Board
• 23" Solid State Monitor
• Play Meter (Coin Meter)
• 1-Year Warranty on Logic Board, Potentiometer and Monitor
• Illuminated Coin Switch
• Side Mounted Knobs
• $500 Locking Coin Vault
• .25/50 Cent Play
• Option Displayed Between Games

Shipping Weight: 180 lbs.
Shipping Size: 30" x 36" x 30"
Power Requirements: 115 Vac, 60 Cycle, Single Phase, 3 Wire Plug, 100 Watts.





Goal Kick

Manufacturer *Sega*
Release *1974*
Class *Ball and Paddle*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Goal Kick is a vertical soccer-like ball and paddle game from Sega. Players use knobs to control soccer players and a shoot button to kick the ball into the goal.

Gran Trak 10

Manufacturer *Atari*
Release *1974*
Class *Wide Release*
Genre *Racing*
Mode *1 Player*
Gameplay *Single*
Panel Layout *Single Player*
Controls
- **Steering:** *Wheel*
- **Shifter:** *4-position (1/2/3/R)*
- **Pedals:** *2 [Accelerate|Brake]*

Monitor
- **Orientation:** *Horizontal*
- **Type:** *TV Monitor*
- **CRT:** *Black and White*

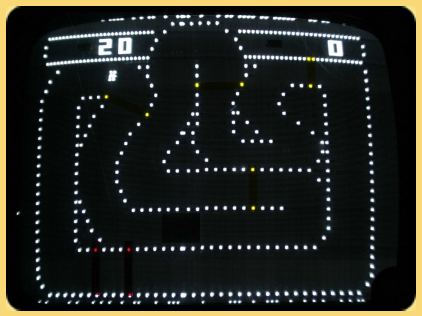
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright Cabaret/Mini*

Gran Trak 10 is an arcade game developed by Atari through its subsidiary Cyan Engineering, and released by Atari in May 1974.

In the fall of 1973, Atari began work on a driving game, an idea founder Nolan Bushnell had wanted to do since the company was initially founded in June 1972 before it was shelved in favor of Pong. The design work itself was handled by Cyan Engineering, which had recently become a semi-independent research and development subsidiary of Atari and had previously handled the prototype design of Gotcha. Larry Emmons developed the circuits to control the car itself in the game, creating the feel of braking, acceleration, and movement. Emmons also used integrated circuit-based memory—specifically, mask ROM (read-only memory)— in his circuit design to store graphical data such as the tracks, rather than the diode arrays that previous arcade games used. This is believed to be the first use of integrated circuit-based memory in an arcade game, and ROMs thereafter became the standard for arcade and console video games. The mechanical designs for the game, including the steering wheel, pedal, and gear shift controllers, were developed by Eigen Systems, located in the same building as Cyan and founded by ex-coworkers of the Cyan founders Emmons and Steven Mayer. At one point, the game's design included a small printer that would print high scores when achieved, but this was removed prior to the final design.

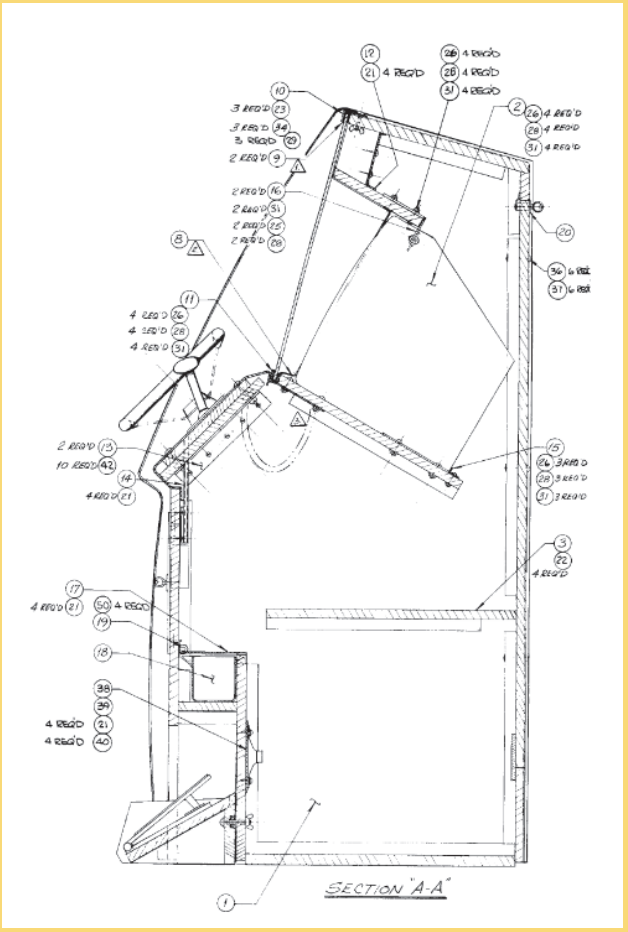
Allan Alcorn, the designer of Pong, took a leave of absence from the company beginning in September 1973, and around the same time Steve Bristow, who had previously worked with the founders of Atari on the first arcade video game Computer Space, left to co-found Kee Games. This in turn left Lloyd Warman, new to the company, as the head of engineering for Atari during Gran Trak's development. Alcorn and Emmons have stated that they felt Warman was a good engineer but a poor project manager, which led to the Gran Trak project running behind schedule and having several design problems. This was exacerbated by a new short-lived Atari management team and product development structure, which led to several communication problems and cost overruns. When Atari began production in early 1974, it had difficulties getting enough circuits to build the cabinets from National Semiconductor, who cited a "hybrid" integrated circuit design by Emmons as non-standard, first refusing to sell them to Atari and then producing only small production runs. According to Alcorn, the non-standard design was a tactic to prevent competitors from copying the design, as other manufacturers would be unable to produce it at all.

A short run of Gran Trak systems was produced in March 1974 and revealed other design problems, such as the steering controls; in their prototype system, Eigen used real a real car steering wheel and pedals, but the production run used different parts. Alcorn returned to Cyan that month and redesigned the game to fix the flaws and use more standard parts; the copying protection scheme was changed to use a custom-designed integrated circuit that was named the same as a standard Texas Instruments integrated circuit. Alcorn later stated in an interview that neither Warman nor Emmons understood the challenges in converting a prototype design to a product that could be manufactured. The game entered production soon after, and Atari announced it was shipping a full production run in May 1974. Although the design flaws were fixed, the communication problems during development led to one final problem with the game: Atari was unclear on the actual cost of producing the game. As a result, a single Gran Trak game ended up costing



\$1,095 to manufacture, while Atari was selling them to distributors for only \$995, losing \$100 per sale. Atari soon corrected the problem, but ended the fiscal year with a large loss due in part to the financial failure of the game.

Gran Trak 10 is a single-player racing video game in which the player drives a race car along a race track, shown from above. The player controls the car with a steering wheel, accelerator and brake pedals, and gear stick, as in a real car. The gear shifting requires the player to shift between reverse, first, second, and third gears as needed, but the pedals are digital controls rather than analog, so the player cannot control his speed by applying differing levels of pressure. The steering wheel turns the car only while it is being turned, rather than having a neutral "straight" position. Braking does not stop the car instantly and turning while braking will cause the car to skid. The course is defined on the screen by walls of white dots representing pylons, which if hit stop the car and spin it. There is only a single track layout. The track contains one black path representing an oil slick, which prevents the player's car from turning. At the top of the screen are two numbers; the number on the right is the remaining time in the game, starting at 78 and counting down by 2s, while the number on the left is the number of checkpoints the player has passed, and counts up by 2s.



The time per game, despite the counter always starting at 78, is by default 105 seconds and is adjustable by the game operator; changing the time adjusts both the speed of the counter and how long a player spends crashed after hitting a pylon. A switch on the internal circuit board can turn off crashes entirely, while another allows for two games to be played for a quarter rather than one. A placard on the front of the game gives suggested ratings for the score in a given game,from "License Revoked" for 10 or fewer points to "Real Pro" for greater than 40; the operator's manual suggests chang ing or removing this card if the time per game is adjusted.

Atari reported a loss of \$500,000 for the 1974 fiscal year, roughly as much as the previous year's profits, with Gran Trak as one of the major causes. This led Atari into deep financial problems, leaving part of Gran Trak's legacy being "the game that nearly put Atari out of business". In September 1974, Atari announced plans to merge with its subsidiary Kee Games; Kee's final game Tank, released in November 1974, was a commercial success, however, and is credited with buoying the finances of the newly merged Atari at a critical time for the company. The Gran

Formula K

Manufacturer	*Kee Games*
Release	*1974*
Class	*Wide Release*
Mode	*1 Player*
Genre	*Racing*
Sound	*Amplified Mono (one-channel)*
Cabinet Styles	*Upright*

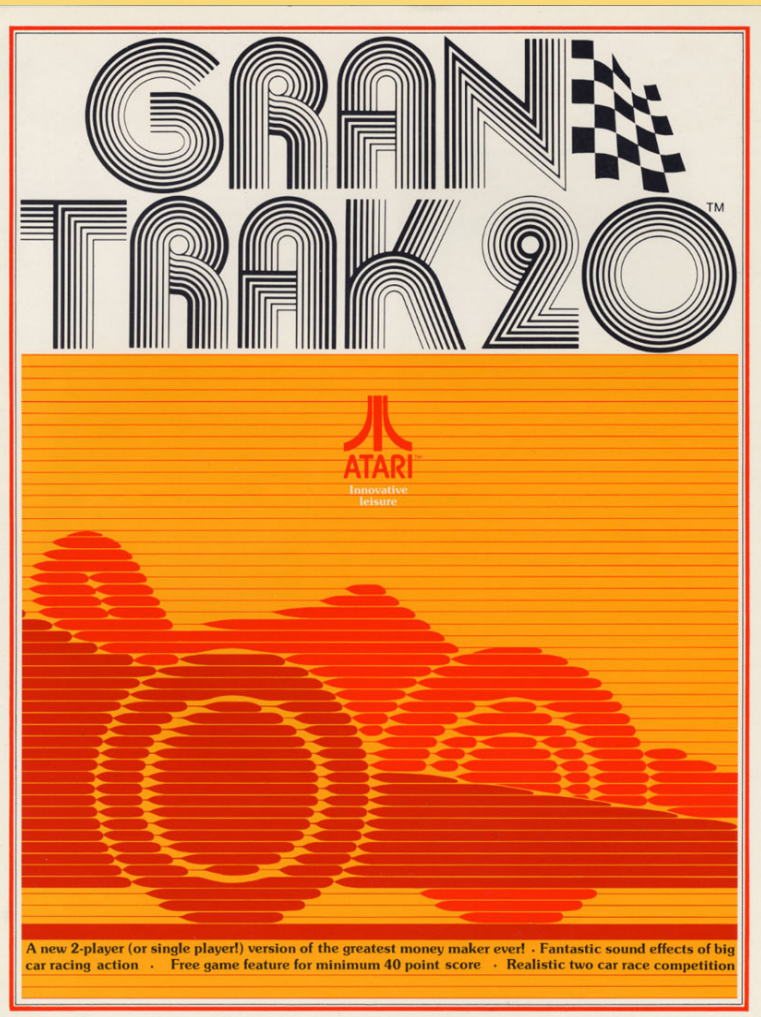
Trak 10 game itself, after its problems were resolved, was considered a success, and Atari released multiple versions of it: a clone version titled Formula K was released through Kee Games for different distributors around July 1974, and Atari produced a small cabinet version in late in the year titled Trak 10. According to Ralph H. Baer, Formula K sold 6,000 units. Atari produced numerous other racing arcade games in the same style as Gran Trak, including Le Mans (1976), Sprint 2 (1976), Super Sprint (1986), and Badlands (1989). Gran Trak 10 was the first arcade car racing video game and the first game to use a steering wheel, and is known as the "grandfather of car-based racing games", though a simple racing game, Wipeout, had been released in 1972 for the Magnavox Odyssey home video game console and a spaceship drag racing arcade game, Space Race, had been released by Atari in 1973.

Gran Trak 20

Manufacturer *Atari*
Release *1974*
Class *Wide Release*
Genre *Racing*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Steering: *Wheel*
Shifter: *4-position (1/2/3/R)*
Pedals: *2 [Accelerate|Brake]*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Gran Trak 20 is a two-player variant of Gran Trak 10. Two players race against each other and the clock in an attempt to complete as many laps as possible. There are also oil slicks on certain parts of the track that will prevent the car from steering. While mostly analog with discrete circuitry, diode-based ROMs are used to store graphics.

"mobygames.com"



Twin Racer

Manufacturer *Kee Games*
Release *1974*
Class *Wide Release*
Genre *Racing*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Conversion Class: *Atari BW Raster*
Sound *Amplified Mono (two channel)*
Cabinet Styles *Upright*

Released in July 1974, Twin Racer was a 1-2 player Kee Games clone of "Gran Trak 20". This game added the new feature of the Ram Effect, which allowed players to knock their opponent off the track. Free play was awarded at 20 points instead of Gran Trak's 40. Another Kee Games innovation with this game was the Automatic Drive Button, which was advertised as 'for ladies and kids – must for arcades'.

"arcade-history.com"

excerpt from the flyer:

The race is on! You're driving to win. Not only against your own time, but against your friend **BESIDE** you!
TWIN RACER gives you that EXTRA competitive thrill - an actual race! And - if you find that you can't **Beat** 'em - RAM 'EM: with our NEW KEEfeature - **THE RAM EFFECT.** Wait for him at the turn and - RAM!! (But, watch out! YOU may be the one to go off the track, So, be careful.)
Lots of thrills, spills & fun with such KEEnote feature as:

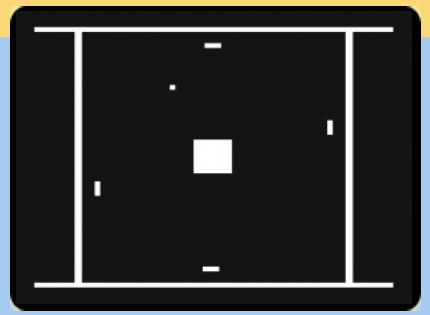
- **THE RAM!**
- **HAIRPIN TURNS!**
- **OIL SLICKS!**
- **COMPETITION!**

May the best driver win! But, even if you don't win the first time - you can take a Victory Lap with Kee's "FREE PLAY" feature! (Get 20 points, and do it again.)
Realistic engine, crash, skid & shifting sound - and, THE RAM!
TWIN RACER!! Do it - Together!

Hesitation

Manufacturer *Allied Leisure Industries*
Release *1974*
Genre *Ball and Paddle*
Mode *4 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Monitor
Orientation: *Either*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Hesitation is a 2 to 4 player ball and paddle game from Allied Leisure.



Mini Hockey

Manufacturer *Sega*
Release *1974*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Mini Hockey is a discrete logic arcade game released by Sega in 1974. It is essentially Pong with two sets of paddles. The game is housed in a small cabinet.

One On One

Manufacturer *PMC*
Release *1974*
Class *Wide Release*
Genre *Sports*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Joystick: *Analog*
Hardware *Discrete Logic*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

One on One is a black and white player versus player (or computer) basketball game.

excerpt from the flyer:

- Fast Break Action
- 10 Second Possession, Player Must Shoot
- Ball Control Action
- Players move at the same speed in all directions (Reaction and Coordination Appeal)
- Opponents Take Immediate Possession if Steal is Made in Black Court
- Positive Stick Shift Control
- Adjustable Timer (1 1/2 min to 8 min.)

Pin Pong

Manufacturer *Atari*
Release *1974*
Class *Wide Release*
Genre *Video Pinball*
Mode *2 Players*
Gameplay *Alternating*
Panel Layout *Single Player*
Controls
Buttons: *2 [Left FlipperRight Flipper]*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Pin Pong is a simple black and white pinball game by Atari. It was one of the first video game to simulate pinball. A patented motion circuit generates the ball. Targets are surrounded by zones that determine the direction the ball bounces in. A gravity algorithm forces the ball downward for a realistic effect.

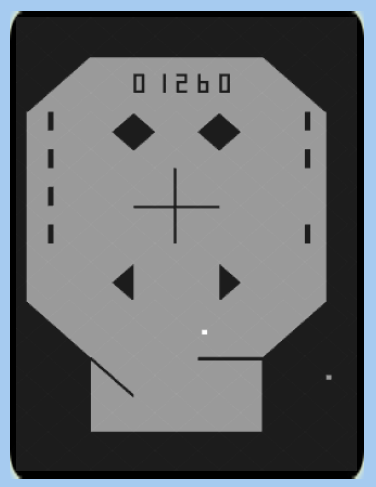
"mobygames.com"

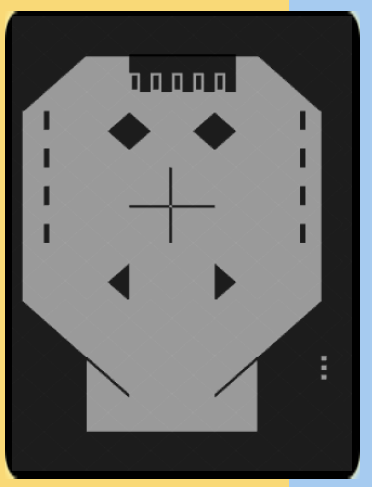
excerpt from the flyer:

Atari's Unique New Concept...
Ping-Pong is so unique, its in a class by itself. In fact, its the only video game on the market that simulates the play of the classic pin-ball machine. Realistic video motion and sound is generated by a specialized computer designed specifically to make the game attractive and reliable. And because the game is stimulating, Pin-Pong is irresistible to players of all ages. It literally invites players to "try their skill" time after time. The Pin-Pong ball is generated by a patented motion circuit, and each target is surrounded by one or more zones that determine the direction of the bounce.

Realistic Video Action...
In Pin-Pong, a gravity algorithm accelerates the ball downward to give realistic pin-ball play on the screen. The ball flipper is genuinely unique to video games and in the normal position, they angle downward towards the center of the screen. When the flipper buttons are pressed, the lower flipper image is blanked and a short time later another image appears, this time as a straight vertical line. The timing used in the flippers gives the illusion of continuous motion.

Pin-Pong: Attractive and Innovative...
Pin-Pong is offered in distinctive, attractive cabinet, with colorful coordinated graphics. The cabinets are tailored to fit each type of location, making the game ideal for virtually any type of location. Pin-Pong has been engineered and tested, inside and out, for maximum player appeal. The video screen is always in motion to attract the first-time player and, the magnetic action assures repeat play. Today the sky's the limit when it comes to Atari's inventiveness.

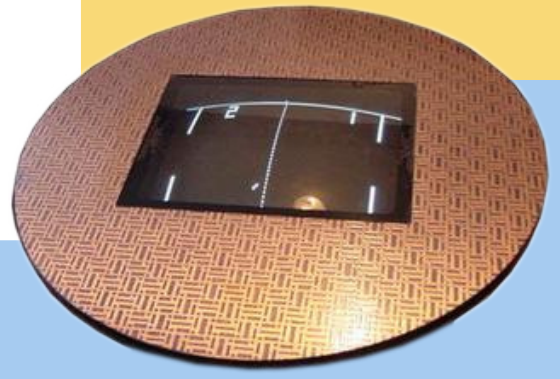




Pong/Hockey

Manufacturer *Electromotion*
Release *1974*
Class *Wide Release*
Genre *Ball and Paddle*
Gameplay *Either*
Panel Layout *Multiple Player*
Monitor
Type: *TV Monitor*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

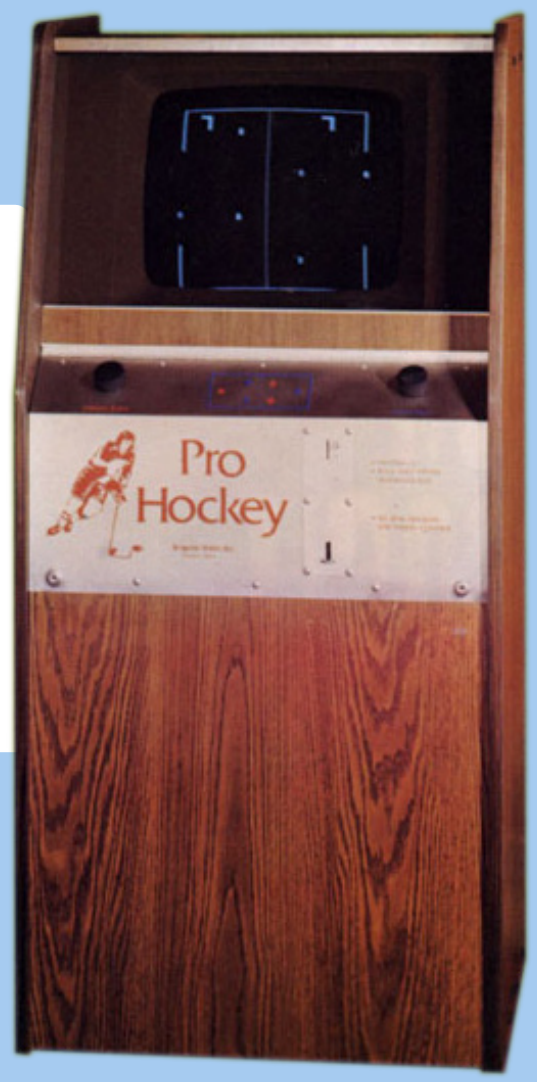
Pong/Hockey is a selectable pong or hockey cocktail table game. It has rotary controls under the top on all 4 sides. Up to four can play.



Pro Hockey

Pro Hockey is a 2 player ponghockey clone. Logic board can be automatically set for either a score of 6 or 9. The machine has tinted plexiglass over the monitor.

Manufacturer *Computer Games Inc.*
Release *1974*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *2 Players*
Gameplay *Single*
Panel Layout *Multiple Player*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*



Pursuit

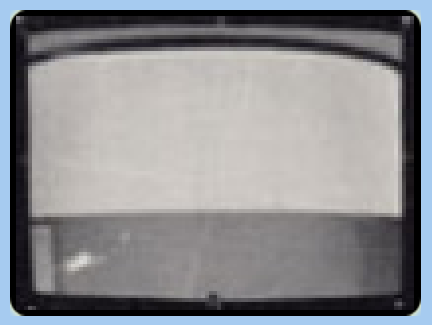
Manufacturer *Atari*
Release *1974*
Class *Wide Release*
Genre *Shooter*
Mode *1 Player*
Gameplay *Single*
Panel Layout *Single Player*
Controls
Joystick: *Analog with one button [Fire]*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Pursuit is a single-player arcade shooter where the player plays a World War I flying ace who tries to shoot down enemy planes.

Gameplay relies on a first person perspective representation. The player uses a flight stick to steer the plane up, down, right, and left to get the enemy in his or her sights. The top-mounted fire button is then used to shoot the enemy plane and gain points.

The game is housed in a custom wide cabinet modeled to look like a World War I biplane cockpit. It includes a similarly modeled flight stick with top-mounted fire button. The game's PCB is composed of discrete technology and includes Atari/Kee's Durastress technology. One overlay provides the onscreen crosshair.

This was the first game to be released after Atari publicly revealed that Kee Games was actually a subsidiary rather than a competitor.



excerpt from the flyer:
"It's Plane Fun!"

Soaring to the heights of your combat mission, you clutch the joystick and intently watch the screen for enemy aircraft. The thrust of your mission is to make it through the attack and down as many enemy planes as possible. Suddenly, on your screen the enemy is sighted, you correct your course, and FIRE! MISSED! It's a wash out. Checking your instrument panel you swing back to get him. This time you're on target, you fire, it's a hit and he explodes! CONGRATULATIONS ACE.

Features...
- Joy Stick Control and Missile Fire
- Game Time Fuel Bar
- Visual Explosions for Each Score
- Score Visually Tallied on Screen
- Skill Indicators
- Extended Play Option for High Score
- Solid State Circuitry
- Hinged Back Door
- Popular Kee Coin Door
- Attractive Wood Grain Cabinet
- Front Mounted Speaker
- Illuminated Screen Border

Qwak!

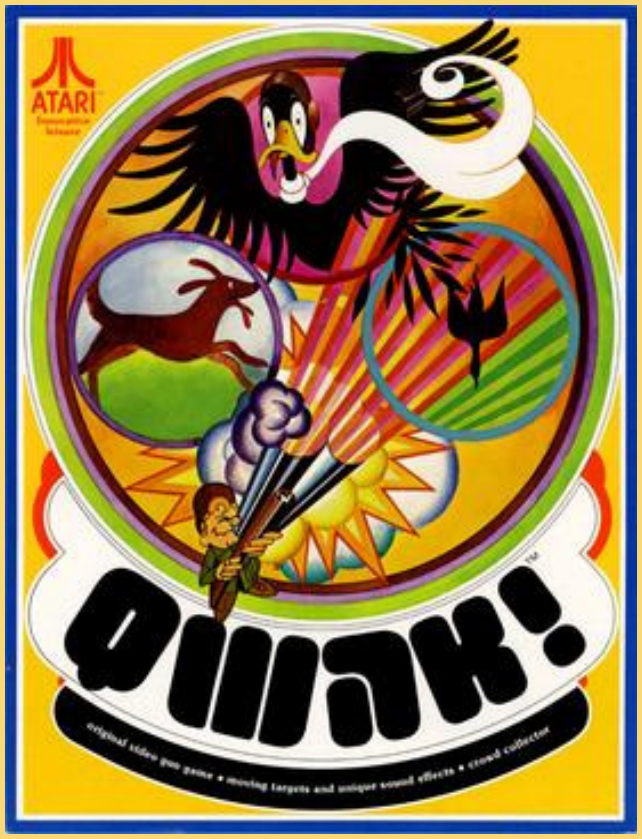
Manufacturer	*Atari*
Release	*1974*
Class	*Wide Release*
Genre	*Light-gun*
Mode	*1 Player*
Gameplay	*Single*
Panel Layout	*Single Player*
Controls	
Gun: *Optical*	
Monitor	
Orientation: *Horizontal*	
Type: Raster: *Standard Resolution*	
CRT: *Black and White*	
Conversion Class: *Atari BW Raster*	
Sound	*Amplified Mono (one channel)*
Cabinet Styles	*Upright*

Qwak! is a single-player duck hunting light gun shooter arcade game developed by Atari.

Qwak! is a single-player duck hunting light gun shooter arcade game in which the player uses a rifle-shaped light gun to fire at targets on the screen. One duck at a time flies across the screen, with each duck appearing in a different place on the sides of the screen and flying in different paths. The player is allowed three shots to hit the duck as it flies across the screen. As with other light gun games, a hit is registered if the gun is pointed at the duck or similar light source when the trigger is pulled; no projectile is fired. When a shot is fired, a mark appears on the screen where the player was aiming; if the shot misses the duck, it changes direction away from the bullet. If the player hits a duck, it falls to the ground, and a hunting dog runs over and collects it. Each duck hit adds a small image of a duck to a row at the top of the screen. An screen overlay shows an image of marsh reeds and a tree branch. The gun is attached to the game cabinet by a metal cord, and is holstered in a small circular recess in the cabinet when not in use. Attempting to remove the gun sounds an alarm buzzer. Each game costs a quarter, and runs until the time limit runs out. Machines have adjustable time limits or can be set to run each game indefinitely, starting the score count over when the start button is pressed.

The game was developed by Atari, beginning in 1974; the earliest schematics in the service manual are from June 1974, while the last is from November. The schematics bear the logos of both Atari and Kee Games. The game was announced and shown at the Music Operators of America (MOA) Music & Amusement Machines Exposition on November 1–3, 1974, for release that month. It was then advertised in the December 7 issue of Cash Box.

Qwak! was released in a standard upright arcade cabinet with a black and white raster television monitor inset, with the rifle holster and start button below as the only controls. The reeds and tree branch overlay is screen printed in color onto a clear panel in front of the monitor, and is backlit by the screen; the screen is lit with a gray background instead of a black one in order to produce this effect. When the gun is triggered, the duck additionally flashes white briefly, so as to be detected by the light gun; the relative brightness of the screen makes this effect less obvious than with other similar light gun games. Qwak! was not the first light gun video game; it was preceded by the arcade game Balloon Gun (August 1974) and a light gun game for the Magnavox Odyssey video game console (1972), as well as non-video game light gun games since the 1936 Seeberg Ray-O-Lite.



Qwak did not perform well commercially; according to Ralph H. Baer in his book Videogames: In the Beginning, it sold only approximately 250 units. In the November 16, 1974 issue of Cash Box, U.S. Billiards announced a two-player clone game titled Duck Shooting; the game features a projected seven foot by seven foot screen instead of a monitor, and allows two players to shoot at multiple ducks at once.

In 1982, Atari developed a prototype for a touch-screen duck themed game similarly titled Qwak. With the goal of “Help mama duck and her three ducklings get home safely”, the player shifts picture blocks into place to create a safe path for the ducks to get home. The player’s

score in the 15 levels is determined by how long the ducks are on-screen and by how many get home safely.

Additionally, critics have noted the similarity between Qwak! and the 1984 Nintendo light gun game for the Nintendo Entertainment System titled Duck Hunt. Nintendo used that similarity in a 1986 court case attempting to invalidate a patent held by Sanders Associates; the patent, filed by Ralph Baer, was for the light gun peripheral used in the Magnavox Odyssey light gun game and held to be infringed on by Duck Hunt. Nintendo unsuccessfully claimed that Baer had based his patent not only on the Odyssey work but also on Qwak! as seen by him at the 1974 MOA show.

excerpt from the flyer:

Another Video Action Favorite!
Qwak™ is the newest addition to Atari's unique line of video skill games. It's a sensational one player attraction with video ducks flying up and around the screen. The player clutches a rifle - attached to the game by a steel cable - and "fires" at flying ducks. A specially developed light gun has been installed in the barrel of the rifle, and immediately after pulling the trigger, the screen shows you where your shot was placed by lighting up at the exact spot hit. Players are allowed three shots to hit each duck before it disappears and another flies out. The flying ducks make unusual authentic "qwak" sounds.

QWAK - It's a Hit!
If the player hits the duck, it folds its wings and nose-dives for the marsh below, and the hit duck makes a "buzz bomb" sound as it falls. To complete the

video display, a dog runs out from the right-bottom of the screen towards the fallen duck, picks up the duck, and disappears off the left bottom side. After the dog exits, another duck flies out. Ducks never fly out of the same path, and "veer" if a shot is placed near them. The score of hit ducks is visually tallied across top of the screen. Qwak is an accurate skill test that brings 'em back again and again - it's a crowd-collector, with great location versatility.

Atari - Innovative Technology
QWAK, like all previous Atari games, features solid state computers tested with the unique Durastress™ process. All computers carry a one year warranty, and all monitors are 23" C.S.A. approved. Operator adjustable items include extended time, free games, and game time limits. Qwak has a specially designed alarm system in the event that the gun is ripped off. A constant buzz sound similar to the diving duck noise continues to alert location owners.

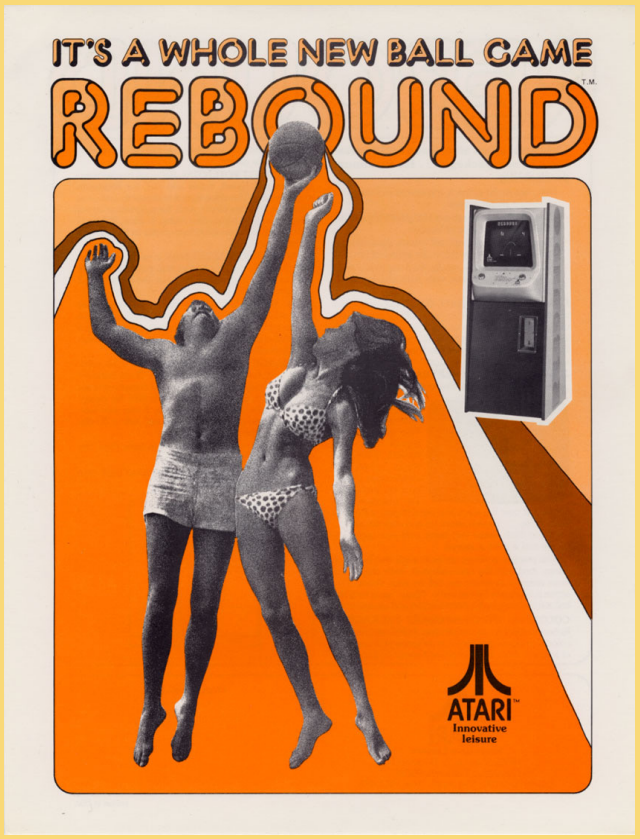
Rebound

Manufacturer *Atari*
Release *1974*
Class *Wide Release*
Genre *Sports*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Rotary: *Analog with push-down button*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Rebound is a two-player black and white volleyball game where players use paddles to serve the ball and hit it over the electronic net in the middle of the screen.

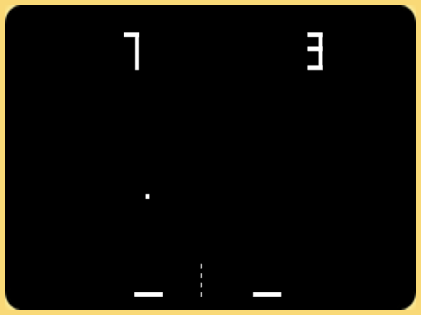
Rebound was developed by Atari, beginning in late 1973; the final schematics are dated November 31, 1973, and use the code name "Volleyball". 1973 was near the beginning of the start of the arcade game industry; after the success of Atari's Pong, the first game by the new company and fourth arcade game ever produced, the nascent industry was largely composed of variations on the concept, called "ball-and-paddle games". While Atari created games with other gameplay types in 1973 and 1974, such as Space Race (1973) and Gran Trak 10 (1974), it also created several Pong-like games. Rebound was a variation on that theme, featuring controls and gameplay similar to Pong, with the addition of gravity arcing the ball and both paddles moved to the bottom of the screen. Rebound was released by Atari in February 1974, with a release announcement on February 16. Other Atari ball-and-paddle games from 1974 include Superpong and Quadrapong, both of which were variations on the original Pong gameplay.

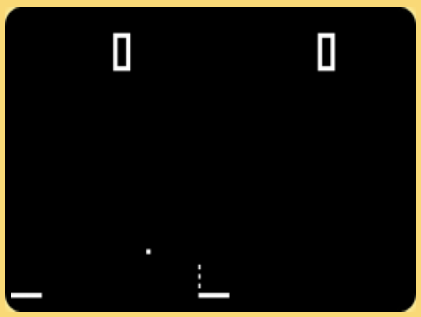
Rebound is a two-player volleyball sports game in which the players, each controlling a paddle representing a person on either side of a volleyball net, attempt to score points. The horizontal paddles are moved by the players left and right on their side of the net, represented by a short dashed line. The ball, represented by a square dot, is dropped from the top of the screen in a parabolic arc; if it hits a player's paddle, it bounces in another arc according to where on the paddle it hit. Bounces from closer to the center are more vertical, while those towards the sides move mostly horizontally. This method of changing the angle of deflection is similar to the mechanics of Pong.

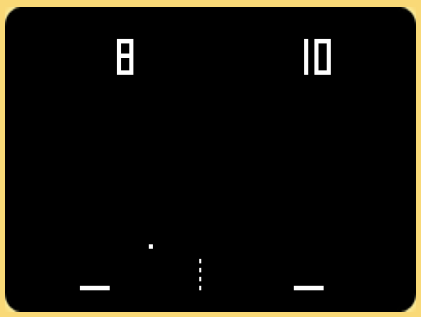


If the ball reaches the bottom of the screen without being deflected by a paddle, bounces on the same paddle four times, hits the net, or is deflected into the side of the screen, then a sound is played and a point is awarded to the player on the opposing side. After a point is scored, the ball is dropped from the top of the screen again. Every two times the ball is bounced across the net by the players without a point being scored the net is grows slightly higher, up to ten times; it resets in height when a point is scored. Two large numbers at the top of the screen record the points for each player. Each game costs a quarter, and machines can be set to play one or two rounds per game. Rounds can be set to play until a player reaches either eleven or fifteen points. Whenever a game is won, the game resets into its "attract mode", where the paddles are stretched across the screen, allowing the ball to bounce along to the side and be re-dropped indefinitely.

Rebound has been described by Retro Gamer as one of the more notable Pong variants. Despite this, unlike many other games of the time Atari did not make a sequel game. Sales numbers are not available for Rebound or Spike; additionally, a table made in 1976 by Ralph H. Baer in his book Videogames: In the Beginning containing sales numbers for most games of the time period does not contain any numbers for the two games. In addition to the stand-alone game, Atari sold conversion kits which could modify any two-player Pong variant they produced into a Rebound game. The kits included a circuit board to plug in to the existing game and decal stickers to cover up the original name on the cabinets with "Rebound". In 1977, Rebound was included as one of the games in Video Olympics for the Atari 2600 home video game console, a collection of Pong variants, as "Volleyball".







excerpt from the flyer:

Only Atari offers all of these exciting features in one package... for maximum profitability

• New, fast-paced action is engineered and tested for maximum player appeal

• Distinctively stylized cabinet and graphics make the unit ideal for any type of location

• Proven, high-profit potential assures maximum return on investment in minimum period of time

• Space-age reliability results from exclusive Atari Dura-Stress™ computer with Atari one-year warranty

IT'S A WHOLE NEW BALL GAME Rebound is the newest video skill game from Atari that features the kind of appealing action you've come to expect from the leader in innovative video games. In fact, Rebound is faster, more fun and potentially more profitable than any video game you've seen yet... from anyone.

JUST LIKE REAL VOLLEYBALL Rebound is a game of skill for all ages. Everyone loves a fast game of volleyball, and that's exactly how Rebound is played. The game is designed for two players, with each player represented on the video screen by a horizontal bar. The objective is to hit the ball over the electronic net and past the opponent. Serve... a quick return up and over the net... back and forth, faster and faster until one opponent misses and a point is scored.

With practice, a player can even angle the degree of return. And, just like real volleyball, each player has three changes to return the ball on each volley. The action is highlighted by an audio "bleep" each time the ball is hit, adding to the overall action and excitment.

COLORFUL, CONTEMPORARY PACKAGING Rebound features an individually styled cabinet, modern graphics. It is designed to fit any type of location, from a neighborhood tavern to fine shops and restaurants. In fact, Rebound can be placed anywhere people gather.

HIGH-PROFIT POTENTIAL Rebound has been engineered and testet, inside and out, for maximum player appeal. The video screen is always in motion to attract the first-time player. And, the magnetic action of Rebound assures replay after replay. In short, Rebound is designed to return maximum profits in the shortest period of time.

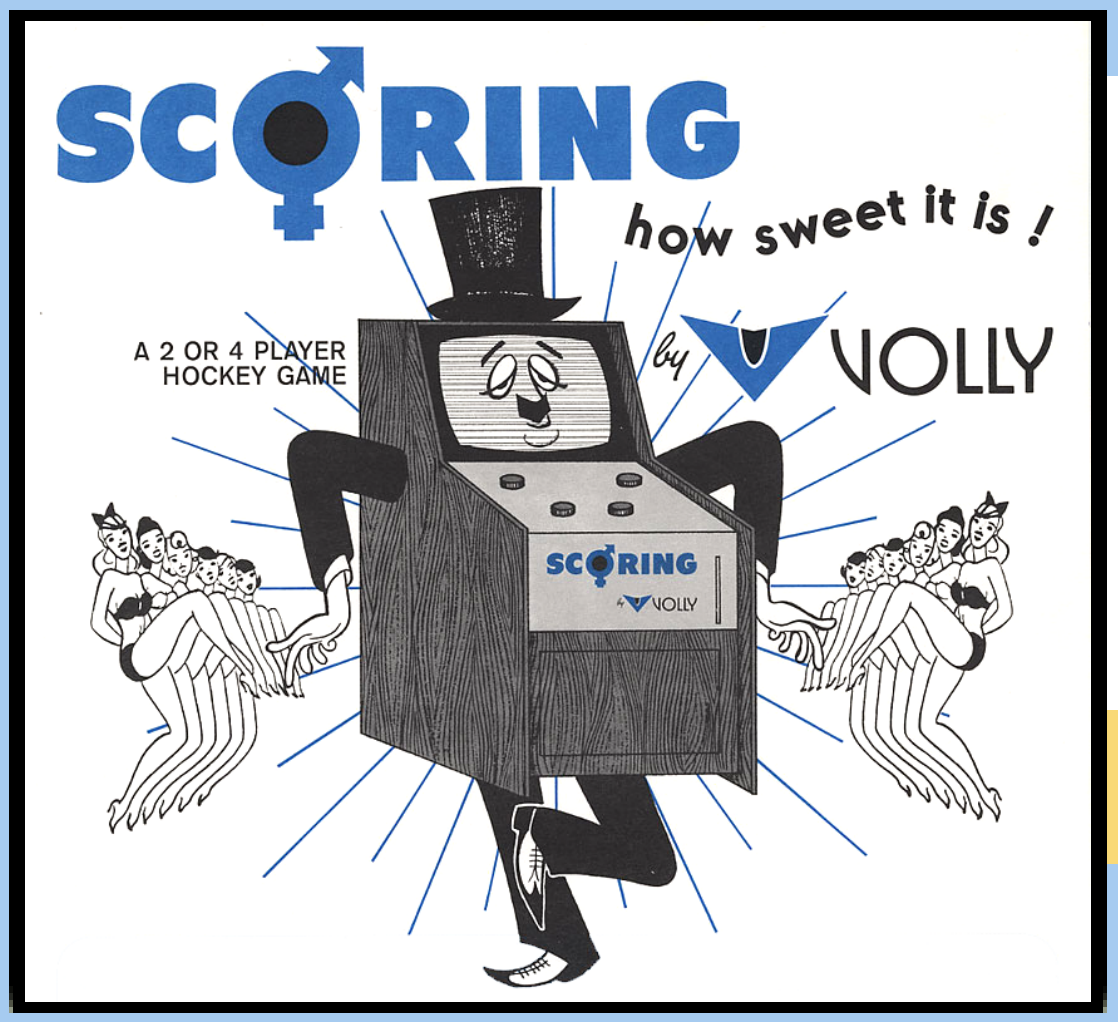
SPACE-AGE RELIABILITY Rebound is all solid-state and features the exclusive Dura-Stress™computer designed by Atari. All major components are fully tested to Military Specifications 883 for exceptional reliability and long service life. A one-year warranty is offered on the computer board with a 30-day warranty on the video display unit.

REBOUND... Another innovation from Atari, the leader in video skill games.

Spike

Manufacturer	*Kee Games*
Release	*1974*
Class	*Wide Release*
Genre	*Sports*
Mode	*2 Players simultaneous*
Gameplay	*Competitive*
Panel Layout	*Multiple Player*
Controls	
Rotary:	*Analog with push-down button*
Sound	*Amplified Mono (one channel)*
Cabinet Styles	*Upright*

Spike, by Atari subsidiary Kee Games, is functionally almost identical with the addition of a "spike" button; this button made the player's paddle jump into the air, potentially bouncing the ball into a downward trajectory like a volleyball spike.



Scoring

Manufacturer *Volley*
Release *1974*
Genre *Ball and Paddle*
Mode *4 Players simultaneous*
Gameplay *Either*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright Cocktail*

Scoring is a 2 to 4 player hockey game from Volley.

Smatch

Manufacturer *Rene Pierre*
Release *1974*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *4 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Special Sound System*
Cabinet Styles *Upright*

Smatch is a French Pong clone.

excerpt from the flyer:

This tennis game played on a screen-court, is a RENOVATION OUTDATING all its predecessors.

In fact, the luminous rackets are moving over their fields in ALL DIRECTIONS, free of any restriction.

The sets are played like a real match with ALL IMAGINABLE PHASES of an inspired game, such as approaching or coming up to the net, a smash, a volley and so on.

Every time a stroke marks a point, it is AUTOMATICALLY posted and the ball is returned to the end of the court waiting to be driven off by the server.

The game is over when one of the two players has won a total of 11 points.

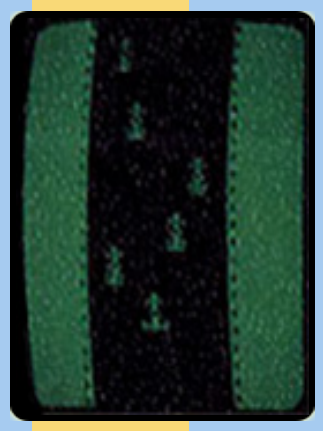
CHARACTERISTICS

Sumptuously built piece of furniture, of veneered stratified boards in two shades.

Presenting a modern and stylish shape and warranting smallest possible volume together with very firm stableness.

Speed Race

Manufacturer *Taito*
Release *1974*
Class *Wide Release*
Genre *Racing*
Mode *1 Player*
Gameplay *Single*
Panel Layout *Single Player*
Monitor
Orientation: *Vertical*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright cocktail/Mini*



Speed Race is a racing game released by Taito in 1974. It was one of the first driving video games, and was groundbreaking for innovations such as vertical scrolling, sprites with collision detection, and driving wheel controls.

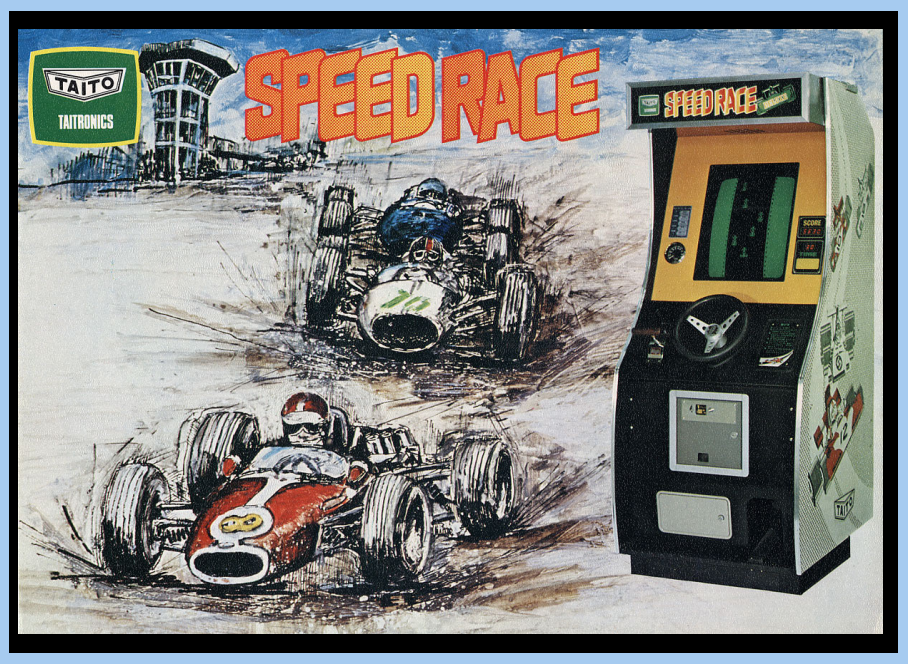
Designed by Tomohiro Nishikado (later known for Gun Fight and Space Invaders), Speed Race was an early driving/racing arcade video game. The game was also released under the re-branded titles “Racer” and “Wheels” by Midway in 1975.

Speed Race’s innovations included sprite graphics (in contrast to the lines and dots of earlier games like Pong); use of read-only memory; collision detection, where cars could collide with each other; and scrolling, where the cars moved along a vertical scrolling overhead track, with the course width becoming wider or narrower as the player’s race car moves up the road. The player races against other rival cars, more of which appear as the score increases. The faster the player’s car drives, the more the score increases.

In contrast to the volume-control dials used for Pong machines at the time, Speed Race featured a realistic racing wheel controller, which included an accelerator, gear shift, speedometer, and tachometer. It could be played in either single-player or alternating two-player, where each player attempts to beat the other’s score. The game also featured an early example of difficulty levels, giving players an option between “Beginner’s race” and “Advanced player’s race”.

Speed Race was the second Japanese video game (after Taito’s Basketball) licensed for release in North America, where Midway released it under the titles “Racer” and “Wheels”. Under the re-branded title “Wheels”, the game sold more than 7,000 cabinets in the United States, making it a major hit for Taito and Midway in North America, opening the way for Japanese video games in the North American market. In 1976, it was the second highest-grossing arcade game in the region. The game’s success led to a lucrative relationship between Taito and Midway, which would later bring over other Taito hits to the US, including Gun Fight in 1975 and especially the blockbuster hit Space Invaders in 1978.

“giantbomb.com”



Racer

Manufacturer *Midway Manufacturing Co.*
Release *1975*
Class *Wide Release*
Genre *Racing*
Mode *2 Players*
Gameplay *Alternating*
Panel Layout *Single Player*
Controls
Steering: *Wheel*
Shifter: *2-position (low, high)*
Pedals: *1*
Monitor
Orientation: *Vertical*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

- Speed shift control
- Adjustable timer feature
- Tachometer
- Accelerator pedal
- Engine sound effects
- 25¢ play
- Extended play
- Cabinet dimensions
- Cabinet dimensions
24” x 32” x 52”
61cm x 79cm x 132cm
- 23” Motorola Solid State T.V. Monitor
- Seat Optional

Wheels

Manufacturer *Midway Manufacturing Co.*
Release *1975*
Class *Wide Release*
Genre *Racing*
Mode *1 Player*
Gameplay *Single*
Panel Layout *Single Player*
Steering: *Wheel*
Shifter: *2-position (low, high)*
Pedals: *1*
Monitor
Orientation: *Vertical*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

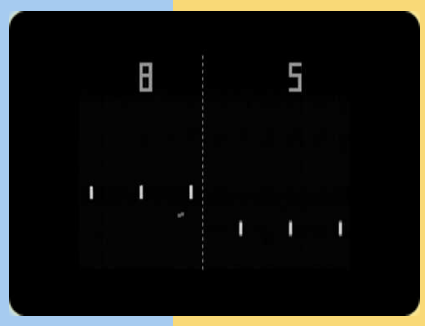
- Speed shift control
- Adjustable timer feature
- Tachometer
- Accelerator pedal
- Engine sound effects
- 25¢ play
- Extended play
- Cabinet dimensions
28” x 38” x 65 3/4”
- 23” Motorola Solid State T.V. Monitor

Spike It!

Manufacturer	*Computer Games Inc.*
Release	*1974*
Mode	*2 Players*
Genre	*Ball and Paddle*
Cabinet Styles	*Upright*

Superpong

Manufacturer	*Atari*
Release	*1974*
Class	*Wide Release*
Mode	*2 Players*
Genre	*Ball and Paddle*
Hardware	*Atari Discrete logic*
Sound	*Amplified Mono (one channel)*
Cabinet Styles	*Upright*



Superpong was a one or two player contest. This game was an evolution over Pong that used variable ball speeds, angles and three paddles vertically aligned for each player. To further spiceup the game, the ball was served from random positions on the screen. Atari described Superpong as not easily mastered, but since it is a relatively unknown game, it was probably too hard at a time where ball and paddle games were losing their appeal. Pong competition was too fierce at this point in the coinop world for Superpong to make any sort of impact. The hardware featured a discreet logic design and was advertised as Durastress, as well as marketed with Ataris Innovative leisure slogan.

"arcade-museum.com"

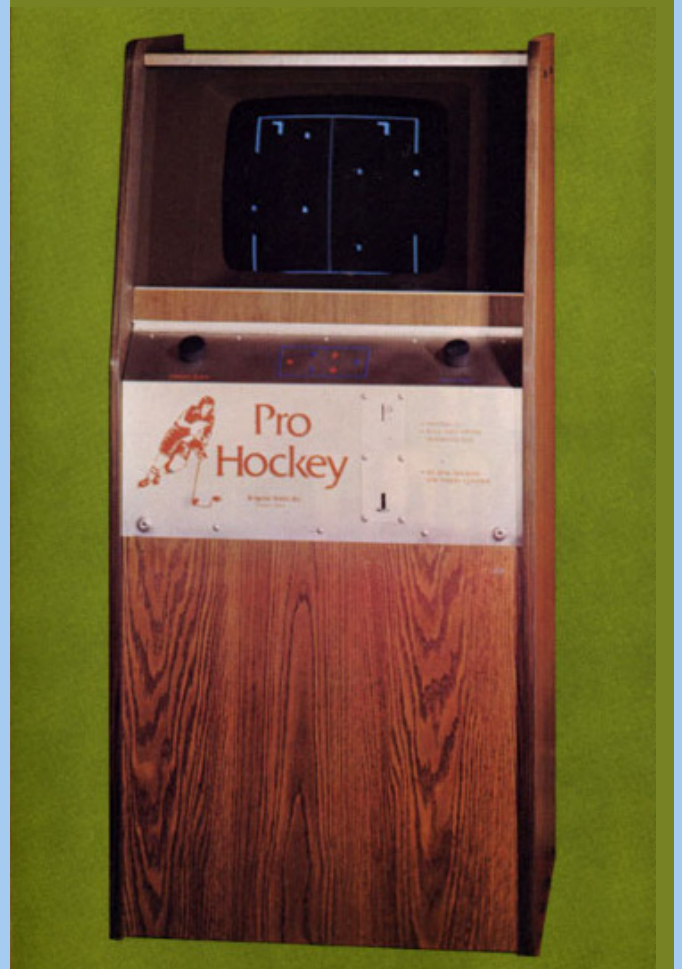
TENNIS

2 or 4 player game in one cabinet! Constant video action. Leads to continual re-plays for all players involved. 25¢-2 players, 50 ¢-4 players. Court lines top and bottom for easy player visability. Start button eliminates instant ball serving. Authentic sound effects enhance the players enthusiasm.

One year warranty on all logic boards.

SPIKE-IT

A whole new exciting dimension in T.V. games that fills the cash box. New from C.G.I. —Joy Stick controls that allow 2 players the advantage of moving paddles in any direction on the playing field. A complete field range at each movement of the controls. Skillful players will spike the ball several times in the course of a play action game. Lots of unusual action. Game of 11 is over when number flashes.



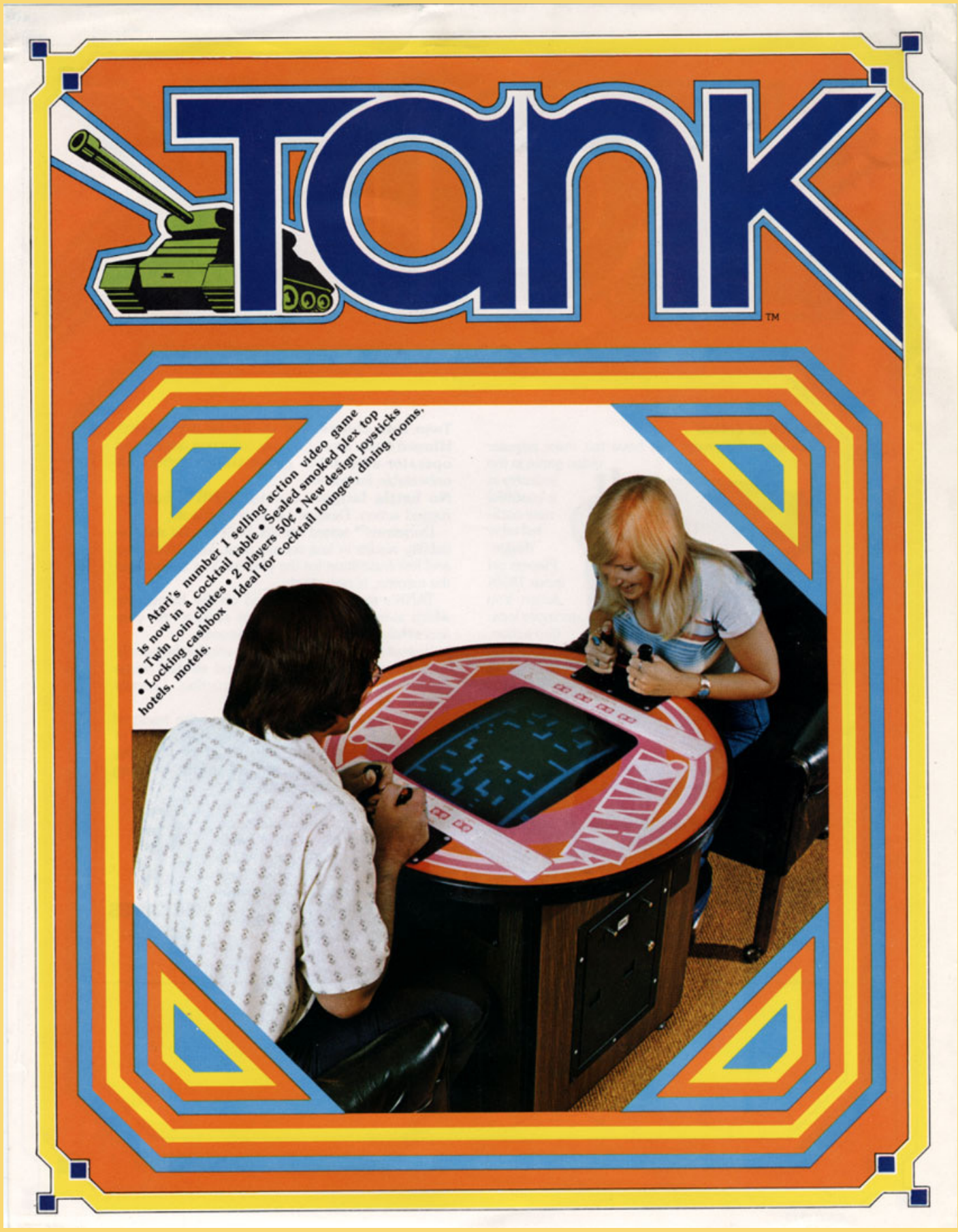
HOCKEY

Exciting 2-player video game with each person controlling his own goalie PLUS a left and right wing player. Logic board can be automatically set for either a score of 6 or 9. Constant action on video screen increases players skill to play again and again. Tinted plexiglass gives excellent clarity for the viewer. Player diagram on panel indicating each contestant's own team players.

Table Hockey

Manufacturer *Sega*
Release *1974*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Monitor
Orientation: *Vertical*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *cocktail*

Table Hockey is a discrete logic arcade game released by Sega in 1974. It is essentially Pong with two sets of paddles, the "table" referring to the fact it comes in a cocktail cabinet.



Tank is a two-player game. Each player controls a tank, and their goal is to destroy each other. In the game, two players drive tanks through a maze viewed from above while attempting to shoot each other and avoid mines, represented by X marks, in a central minefield. Each player controls their tank with a pair of joysticks, moving them forwards and back to drive, reverse, and steer, and firing shells with a button to attempt to destroy the other tank. The destruction of a tank from a mine or shell earns the opposing player a point, and tanks reappear after being destroyed. The winner is the player with more points when time runs out, with each game typically one or two minutes long. The tanks are controlled by two joysticks each. Pushing both joysticks moves the player's tank forward, and pulling them both back causes the tank to stop. A button on the top of the right joystick fires a shell.

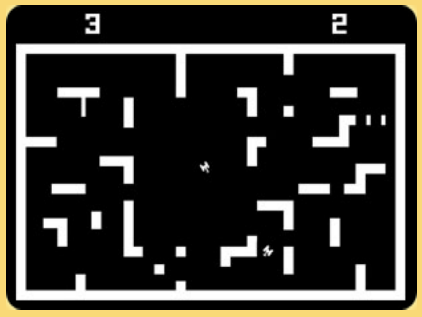
Tank was developed by Kee Games, a subsidiary of Atari, and released in November 1974. It was the only original title not based on an existing Atari property developed by Kee Games, which was founded to sell clones of Atari games to distributors as a fake competitor prior to the merger of the two companies. Kee did have its own manufacturing equipment and therefore the ability to develop original titles, however, and after several clone games lead engineer Steve Bristow developed the idea for a new title. Bristow, who had previously worked with the Atari founders on Computer Space, came up with the idea while thinking of how he could improve Computer Space. His idea to correct the perceived shortcomings of the game were to replace its difficult to control rocket ships were to replace its difficult to control rocket ships with more straightforward tanks, and to make it a two-player game instead of a single-player one.

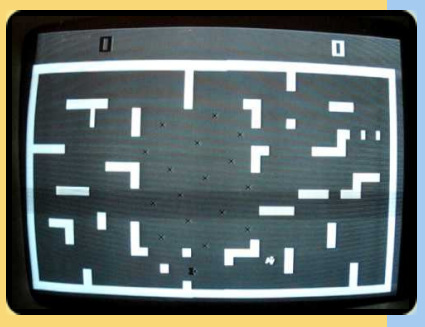
As the company's only engineer, Bristow rapidly developed a prototype himself before turning the game over to new hire Lyle Rains to develop into a finished product, codenamed K2 Tank. Rains added the maze and central minefield to the game design and developed the final hardware, including the simple control scheme. Peter Takaichi designed a large custom cabinet to house it. Tank was one of the first games to use integrated circuit-based memory—specifically, mask ROM (read-only memory)—to store graphical data, rather than the diode arrays that previous arcade games used; it is sometimes claimed in sources to be the very first, but was preceded at minimum by Atari's Gran Trak 10 (1974). Before the game could be completed, in September 1974 Atari announced plans to merge itself and Kee Games back together; Tank was released that November just prior to the merger in December 1974.

Tank was a commercial success and is credited with buoying the finances of the newly merged Atari at a critical time for the company. It sold over 10,000 units, considered a large hit at the time, though Ralph H. Baer claims that was only the 1974 sales, with a further 5,000 sold in 1975. Atari produced a second version of the game, a cocktail cabinet form in which the two players sat across a circular table from each other.

Tank

Manufacturer	*Kee Games*
Release	*1974*
Class	*Wide Release*
Genre	*Labyrinth/Maze*
Mode	*2 Players simultaneous*
Gameplay	*Competitive*
Panel Layout	*Multiple Player*
Monitor	
	Orientation: *Horizontal*
	Type: Raster: *Standard Resolution*
	CRT: *Black and White*
Hardware	*Discrete logic*
Game Specific Settings:	*Tank Pinout* *Tank Dipswitch Settings*
Sound	*Amplified Mono (one channel)*
Cabinet Styles	*Upright* *Cocktail*





excerpt from the cocktail flyer:

Front-line action
Now your customers can have the most popular video game in the industry in a beautiful new cocktail table design. Players get more TANK action. You get more location action. TANK's ideal for the most sophisticated environments - hotel lounges, motels, airports, restaurants. Your location get a handsome cocktail table **and** a **proven** profit building video game.
Gig Gun Ammo.
Exclusive Atari features let you score higher net profits, shell-shock the enemy.
Joystick controls are new, top-mounted, easy for players to use.
Large 19" Monitor, attention-getting game graphics and instructions on the table top mean higher visibility, higher player attraction.
Locking cashbox for tight security
Twin coin chutes (25¢ or 50¢ for two players).
Hinged cash door for easy collection access and **operator-adjustable game time** combine for unbeatable firepower.
No battle fatigue. Cocktail TANK is built for rugged action. Designed to stay on the air. Durastress™-tested circuits, built-in solid state reliability results in less service time, less downtime and less frustration for the players. The action, and the income, is non-stop!
TANK's monitor swings up easily for fast service and easy accessibility to all internal components.
Walnut-grained vinyl-clad plywood side panels, scratch-resistant plex table top and all-steel frame construction makes TANK indestructible. Literally outlives the other table games.
TANK is **the** new cocktail game - the result of many months spent in perfecting the design of a cocktail video game that would be low-cost, reliable, exciting for players and a traffic-building attraction for your locations.
So start playing with the future. Get all the detail on TANK, the new cocktail table game from the originator of video game technology. Call your local Kee Games distributor now or contact us at Atari, Inc., 2175 Martin Avenue, Santa Clara, CA 95050. Phone (408) 984-1900.

Tank II

Manufacturer *Kee Games*
Release *1974*
Class *Wide Release*
Genre *Labyrinth/Maze*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Joystick: *2-way (up, down)*
Joystick: *2-way (up, down) with button [Fire]*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
19-inch Motorola
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

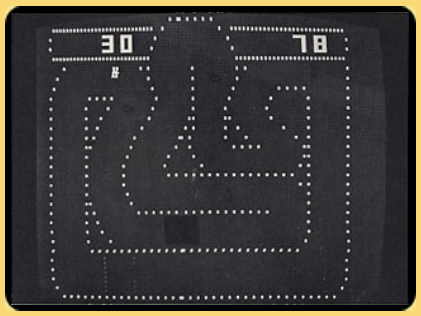
The Tank sequel, Tank II, was released in 1974 to sales of around 1,000 units; gameplay was identical, though the maze could be changed to a new format by modifying the circuitry and more sound effects were added.

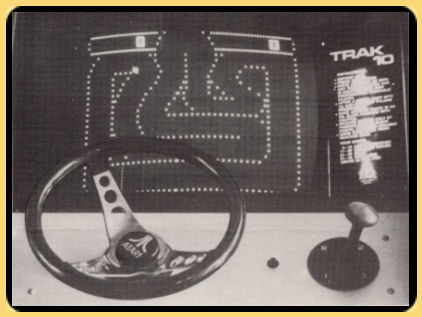
A dedicated console version of Tank II was announced by Atari at the Consumer Electronics Show in 1977, but was cancelled by the end of the year; the joysticks for game, designed by, became the standard joystick controllers for the Atari 2600 (1977).

Trak 10

Manufacturer	Atari
Release	*1974*
Class	*Wide Release*
Genre	*Racing*
Mode	*1 Player*
Gameplay	*Single*
Panel Layout	*Single Player*
Monitor	
	Orientation: *Horizontal*
	Type: Raster: *Standard Resolution*
	CRT: *Black and White*
Sound	*Amplified Mono (one channel)*
Cabinet Styles	*Upright*

excerpt from the cocktail flyer:





Atari's industry-orginal Gran Trak 10 has been repackaged with low-key cabinetry and a 19" video monitor to blend into even the most conservative locations. Grand Prix racing action, complete with the roar of supercharged engine, squealing of tires around curves, adrenalin-pumping crash effect and a new extra added heart-stopper - a brake locking *oil slick* - make the game even more challenging.

Super!

Player drops in his quarter, hits the starter, grabs the wheel and - he's off! Four-speed gear shift (1,2,3,R) changes speed of the car on the screen and the sound of the engine. Foot pedals for gas and brake demand quick reactions around the road-race curves. Watch out for the oil slick! Your brakes lock momentarily and you skid. It takes lots and lots of practice runs. At two bits a run.

Put it anywhere.

Super crowd-attracting race car sound effect are realistic, electronically generated, with volume level operator adjustable. Trak 10 is built to fit almost anywhere. Competition will be fierce. And wait' til the Gran Trak 10 experts hit that Trak 10 oil slick!

Profits.

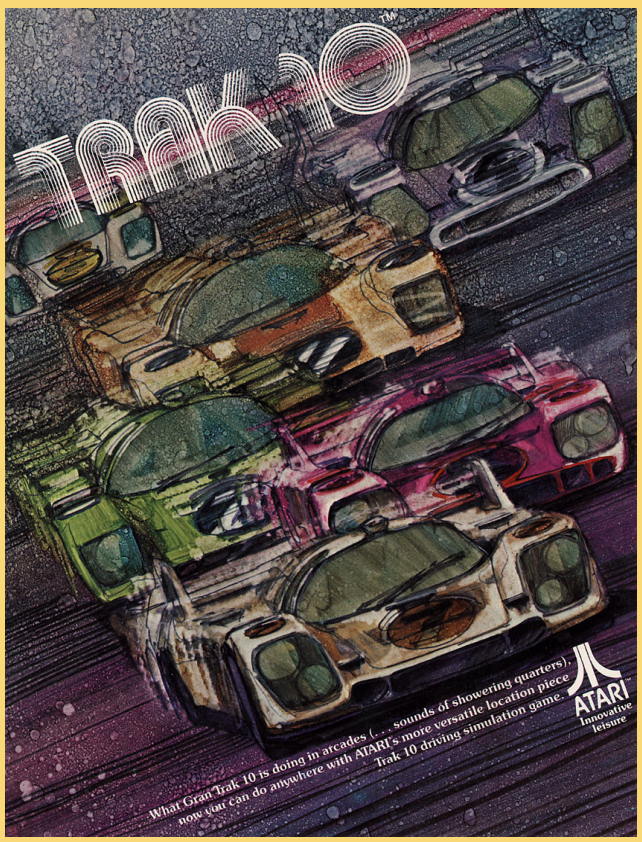
Trak 10 game time is operator adjustable. A slowly-decaying timer shows game time left one the video display. Coin mechanism takes 25¢; one or two games per quarter is operator adjustable. Improved coin acceptor doubles the life of the coin mechanism. Manufacturing efficiencies and design streamlining allow a purchase prise lower than you'd expect. And, since nobody can drive it just once (ask any operator who's got Gran Trak 10 on location), the game's unique drawing appeal plus lower price means nothing but profit!

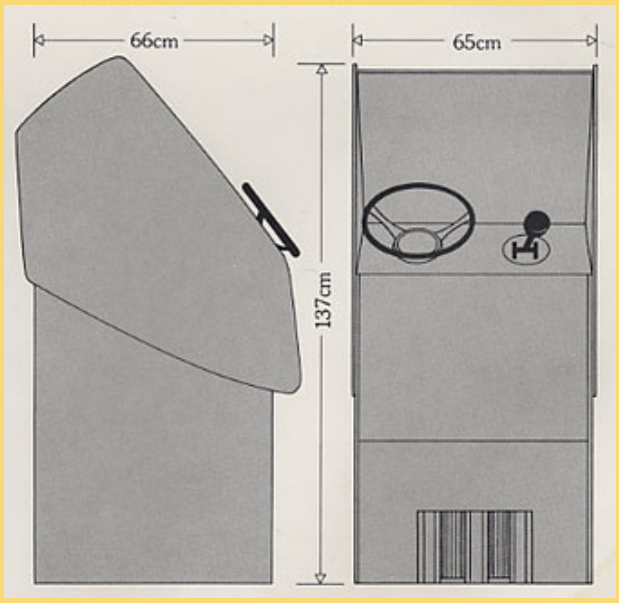
Solidly built.

Complete solid-state, Trak 10 is built to keep working. Atari's special DuraStress™ process makes the computer rugged and trouble free. Warranted for a full year. Full game warranty for 30 days.

Get Trakking!

Innovative leisure is what Atari's all about. Trak 10 is as much fun as Gran Trak 10, and fits any location. See and hear it!





Trak 10 is a smaller cabinet version of Gran Trak 10. The PCB is the same as Gran Trak 10 and virtually the same as Formula K with the exception of revision differences and the substitution of custom ASICs to replace the steering/ Speed/Audio discretes.

TV Goalee

Manufacturer *Chicago Coin*
Release *1974*
Genre *Sports*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

TV Goalee is an obscure but interesting videogame released in 1974 by Chicago Coin.

The TV display is positioned horizontaly and a rich decoration tries to simulate a real football stadium in “3d”.
Apart from that, the game is another pong spin-off, trying to emulate a football game, but with some distinctive features; Ball does not ricochet. Player can play the whole playfield from one end to the other. Players can go up to opponents’ goal line. Crowds roar when goal is made. Sounds of ball being kicked. Referee whistles at start of game and during scoring. Players can block each other - ball can be kicked and dribbled at all angles in the playfield.

Player control all the action. Ball is played from the center line. Both players compete to kick ball into goal. Ball returns to field where kicked out, and is automatically returned.

Thus, TV Goalee represents a real effort to simulate a real football game with the technical limitations of ball & paddle games of the time.

“old-computers.com”

excerpt from the flyer:

NEW LOOK IN TV GAMES!
Upright console cabinet looks completly different - not like a TV but a real playing field. Real 3-Dimensional stadium effect. Realistic, eerie glowing blacklight - just like real soccer!
REALISM.....REALISM.....REALISM.....REALISM .....

BALL DOES NOT RICOCHET (Not like TV Tennis-Type Action)
Just like real soccer! Player can play the WHOLE playfield - from one end to the other. Scores like real soccer.

ELECTRONIC SCORING AND SOUND EFFECTS
Scores displayed on TV monitor. Exciting sounds or real soccer! Crowds roar when goal is made. Exciting sounds of ball being kicked.

decoration bezel

TV Pinball

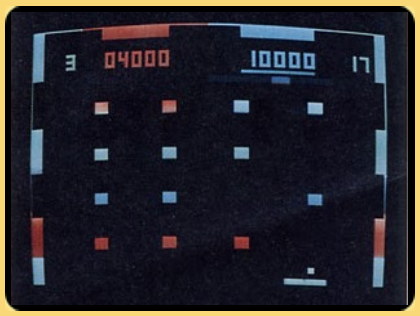
Manufacturer *Exidy*
Release *1974*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *1 Player*
Panel Layout *Single Player*
Controls
Buttons: *1 [Shoot]*
Rotary: *Analog [left/right paddle control]*
Hardware *Discrete Logic*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel) And mechanical pinball chimes*
Cabinet Styles *Upright*

TV Pinball is a ball and paddle game released by Exidy. In the game, players must keep ball in play by bouncing it back up. Knocking out all the targets gives bonus points.

This is a production discrete logic game that came from the Ramtek split along with Table Football/Table Foosballer. The game was also available as “Table Pinball” (cocktail) from November 1974.

TV Pinball’s prototype name was supposedly The Sting.

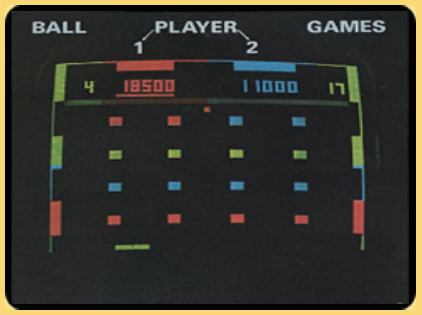
“mamedev.emulab.it”



excerpt from the flyer:

Exidy Shows You How To Win at the Old Money Game with the Industry’s Most Revolutionary New Development.
Unlike any other TV game this one or two player game is as exciting as any FLIPPER with even more action and sound effects. It is a game with lasting power, designed from the beginning with the operator in mind.

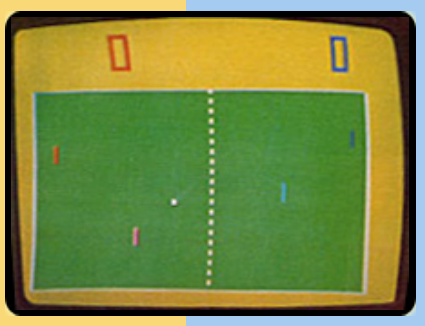
- **BALL** changes speed and direction randomly, never two games alike.
- **FLIPPER** horizontally controlled, will rebound ball right, left, or straight up.
- **16 BUMPERS**, knock them out and score 100 points each. Knock them all out for a bonus of 8000 points.



Wimbledon

Manufacturer *Nutting Associates*
Release *1974*
Class *Wide Release*
Genre *Sports*
Mode *4 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Rotary: *Analog*
Hardware *Discrete Logic*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Color*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Wimbledon is an early two- to four-player color tennis game that is set on a green lawn court with white border lines. Each paddle has its own color.



Wimbledon is a four-player tennis game that used distinctive slider controls in place of the standard rotary controls or joysticks. The game has color. It is set on a green lawn court with white border lines. Each paddle has its own color. It may be a contender to the First "True" Color Arcade.

Wimbledon has unique PCB system, consisting of 4 PCBs in a rack (SYNC, SCORE, BALL/AUDIO and PADDLE pcbs). Game has color output, and uses a modified color TV. All TTL based, no ROMS.

excerpt from the flyer:

• Linig Color TV - Giant Color Screen Instantly Attracts Players

• Green grass

• White border lines

• Bright yellow background

• Rackets are four different colors

Unique, natural action controls color keyed to rackets.

New EZService cabinet with MaxiSafe coin box. All collecting, servicing and adjustments are easily and quickly accomplished from the front.

New InstaFix modular circuitry makes field repairs fast and simple.

FEATURES

• **25¢ and 50¢ play** - for more profit.

• **Adjustable** to 4 players for 25¢.

• **Color TV is ultra-reliable,** solid-state set with stable color circuitry and fill one year warranty.

TV-Joker

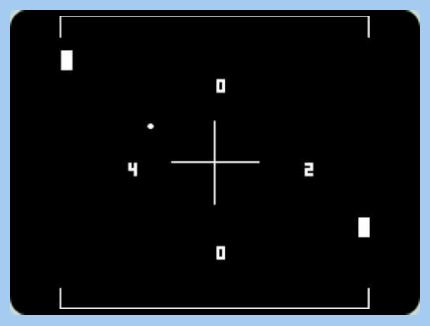
Manufacturer *Zaccaria*
Release *1974*
Genre *Ball and Paddle*
Mode *4 Players simultaneous*
Gameplay *Either*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

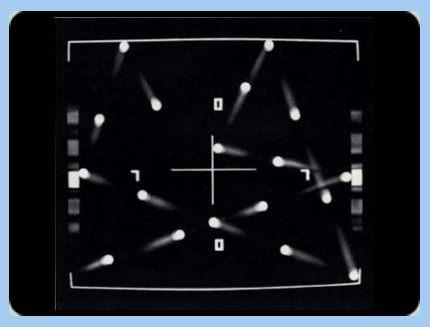
TV-Joker is a ball and paddle sports game from Zaccaria.

Wipe Out

Manufacturer *Ramtek*
Release *1974*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *4 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Rotary: *Analog*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Wipe Out is a competitive ball and paddle game where players try to keep the ball from getting into their goal while keeping their score from dropping down to zero.





WIPE OUT

"A NEW DIMENSION IN GAMES OF ELIMINATION"

excerpt from the flyer:

Wipeout increases the excitement and player involvement of coin-operated elimination games. A special "frustration bumper" bounces the ball in random patterns so players don't get bored. It's a new game every time. There's also a unique scoring system - adjustable from 5 to 7 points - displayed at each goal, that player loses a point. The game ends when all except one player are down to zero. The results? Plenty of action for the money, and the kind of competitive challenge that keeps people coming back for more.

• 25¢ and 50¢ play produces more profit per square foot oflor space.
• Can be played by two or four players.
• Attractive, vertical cabinet fits in anywhere.
• All solid state for low maintenance and long life.
• Commercial quality TV monitor insures reliability.
• One year logic board warranty.
• Engineered interior design prevents tampering, simplifies service.

UNEQUALED SERVICE

Ramtek video games are backed by the most responsive service in the industry. When repairs are needed, they're done fast. And new logic boards can be in the air within 24 hours. When it comes to service, Ramtek doesn't play games.

Easily serviced, tamper-proof cash box.

Designed for easy maintance access.

Alley Rally

Manufacturer *Exidy*
Release *1975*
Class *Wide Release*
Genre *Racing*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Steering: *Wheel*
Monitor
Orientation: *Vertical*
Type: Raster: *Standard Resolution*
CRT: *Black and White with a Color Overlay*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

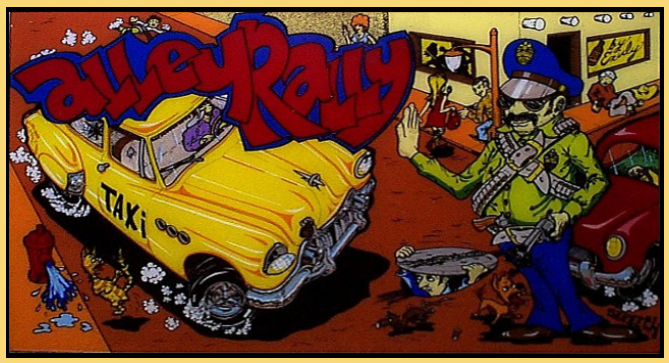
Alley Rally is a Racing game, published by Exidy, which was released in 1975.

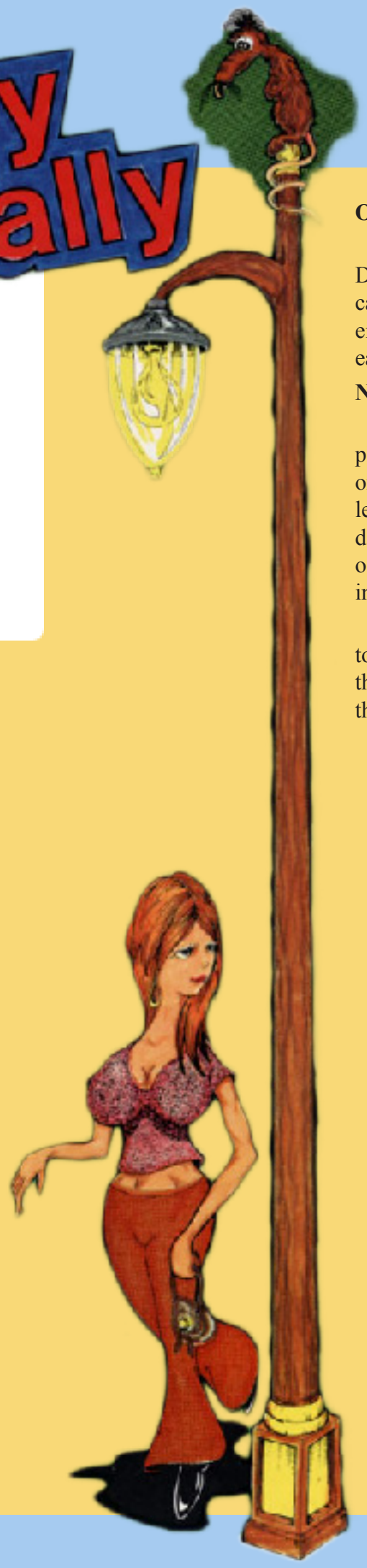
When the game did not sell so well, cabinets were re purposed into “Frankensteined” Death Race cabinets which have become known as “Alley Death Derby” cabinets.

excerpt from the manual:

GENERAL INFORMATION:

ALLEY RALLEY pits the player against the clock and four erratic “drone” cars. The drone cars drive a pseudo-random pattern, change direction, and even skid into the side of the track occasionally. Since they also change speed during all this, it becomes very difficult to drive around the track successfully without crashing into a drone car.





OBJECT OF THE GAME:

The object of the game is quite simple. Drive around the track as long and as fast as you can without crashing into a drone car. You can drive either direction to make points, and you get a point each time you drive 1/4 of the way aroung the track

NORMAL OPERATION:

You drive one of two cars. If you play a one player game, you drive the bright car which appears on the left side of the track, and you drive from the left side steering wheel. A two-player game adds a darker colored car which appears on the right side of the track, and is driven from the right side steering wheel.

The game is started only after the start button is depressed and the cars may move only after the foot pedal is depressed and the shift lever is in the LOW GEAR position.

Anti-Aircraft II (Anti-Aircraft)

Manufacturer *Atari*
Release *1975*
Class *Wide Release*
Genre *Shooter*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Buttons: *3*
Monitor
Orientation: *Vertical*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Anti-Aircraft is a two-player arcade game by Atari, Inc, originally released in 1975. The game is sometimes referred to as Anti-Aircraft II, denoting the two-player aspect of the game.

Planes fly overhead, either singly or in pairs, in random directions in the aircraft flight area. The object is to shoot down more planes than the player's opponent during the time limit. Each player controls an anti-aircraft gun located in the lower left and right corners of the screen, respectively. A player's gun is controlled by three buttons located in each player's control station, which consists of a button for moving up, down, and firing. The up and down buttons move the gun to any one of three predefined positions.

The game is housed in a custom cabinet that includes two sets (one set per player) of three control buttons (up, down, and fire). The game PCB is composed of discrete technology with game sprites stored in ROM. There is an undocumented option available that switches the planes into UFOs. Pin 14 of the 003127 IC — a PROM located at grid location K1 — is tied to ground, but also has a pullup resistor. Cutting the ground trace causes address bit A4 to be pulled high, selecting the UFO data. A jumper can be installed to easily switch back and forth between planes and UFOs. The vertically set monitor is a black and white Motorola XM501.

There is an undocumented option available that switches the planes into UFO's. Pin 14 of the 003127 IC -- a PROM located at grid location K1 -- is tied to ground, but also has a pullup resistor. Cutting the ground trace causes address bit A4 to be pulled high, selecting the UFO data. A jumper can be installed to easily switch back and forth between planes and UFO's. The UFO version of the game was probably never released.

A home console port was included in the Atari 2600 game cartridge, Air-Sea Battle.

excerpt from the flyer:

You're on red alert! Forward observers have plotted enemy aircraft coming into range... now! You have 3 firing position, 3 chances, but you have to be quick. Those planes are really moving. You press the firing button. Missed! You change firing position, shoot again. The enemy plane blows up. You get set for the next attack.

You command your own gun crew. You're there, in the thick of the fighting. Within operator-adjustable game time you have to shoot down more aircraft than the "enemy" gunner to win the battle. Digital scoring for each gun lets you keep track of hits.

Your timing and skill are on the line every second as you try to zero in time after time and blast the enemy out of the sky.

Heavy artillery. ANTI-AIRCRAFT is designed for heavy action. Durastress™ tested solid state circuits and 23" monitor, battle-tested plywood construction and easy accessibility for maintenance means ANTI-AIRCRAFT is always combat-ready.

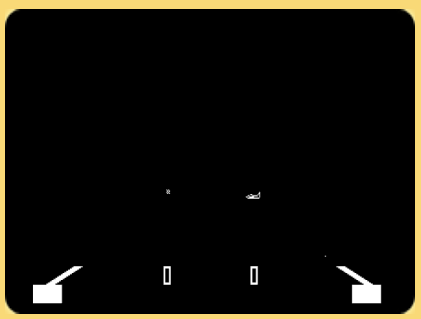
Heavy profits. Your players will want to test their shooting skills time after time. New illuminated attraction panel, side panel graphics and low profile design make ANTI-AIRCRAFT a natural traffic builder and income producer in any location.

Dimensions. Height. 57.87" (147cm), Width: 25.12" (64cm), Depth: 28" (71.12cm)

Put Anti-Aircraft in your battle plan. For all the details contact your local ATARI distributor now or Atari, Inc.

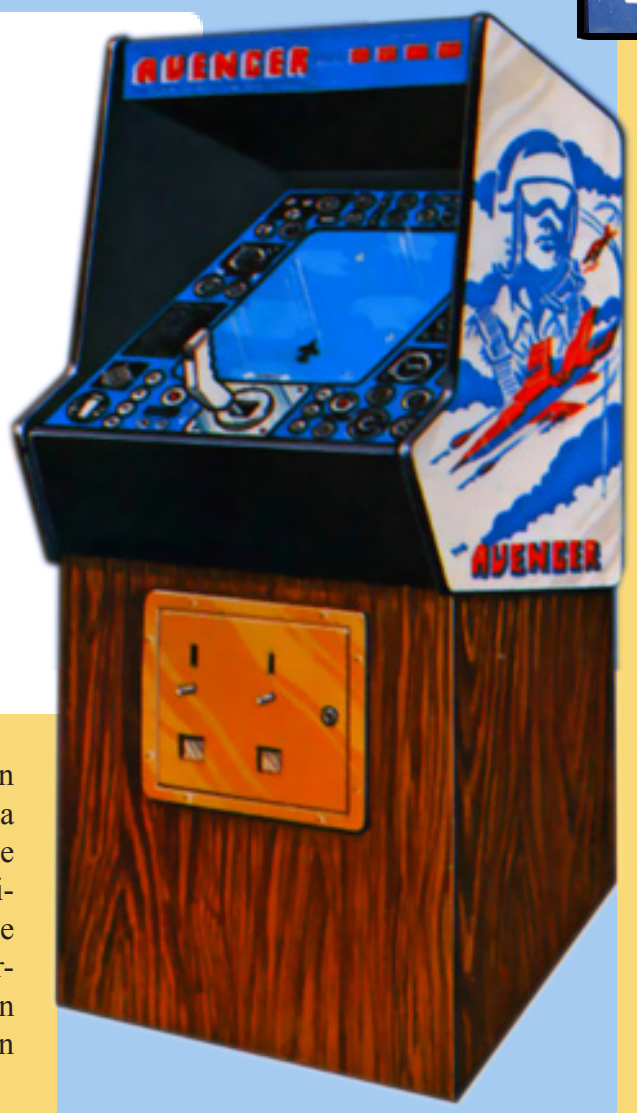
- 1 or 2 "gunners" can play
- Cannons have 3 firing positions

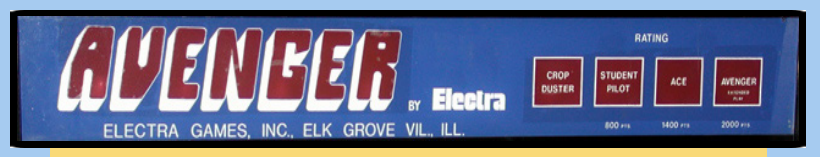
- Each player has 3 firing positions
- Cannons fire. "hits" explode, aircraft scream past guns



Avenger

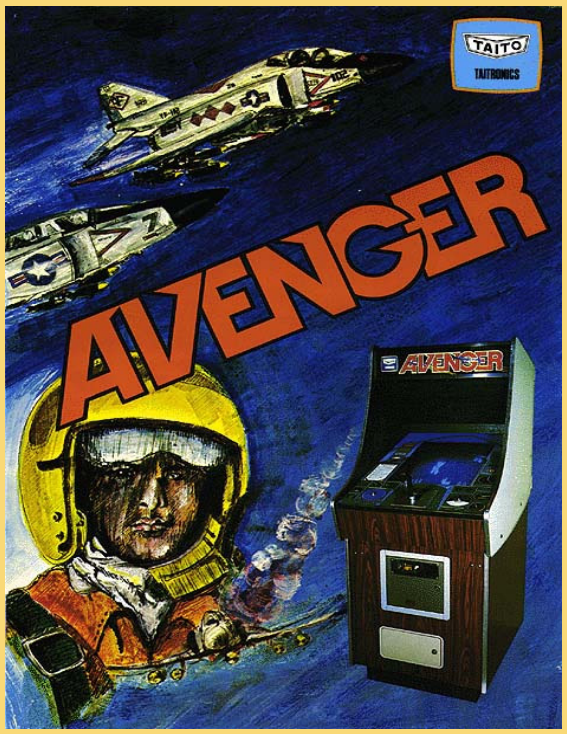
Manufacturer *Electra*
Release *1975*
Class *Wide Release*
Genre *Shooter Shooter*
Mode *1 Player*
Gameplay *Single*
Panel Layout *Single Player*
Controls
Buttons: *1 [Afterburner]*
Joystick: *Analog with one button [Speed/Drift/ Fire]*
Monitor
Orientation: *Vertical*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

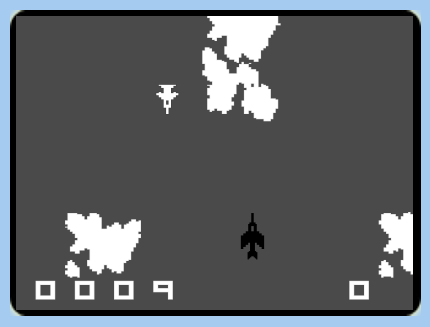




Avenger was produced by Electra in 1975. The game has a top-down view of a aircraft scene. The player fighter is at the bottom and they control its speed and horizontal position with the joystick. The scene scrolls from top to bottom and enemy aircraft appear at top of screen, flying down towards the player. The Afterburner button lets them quickly speed up.

Avenger may be the first shoot'em up with vertical scrolling.





excerpt from the flyer:

"Look Out! Here Comes the AVENGER"

Avenger! The boldest fighter jet ever to roam the skies. It's Electra Games's new single-player video combat game. You're in the life-like cockpit of this sleek, black attack plane surrounded by the realistic instrument panel. Suddenly a "bandit" aircraft lurking behind a cloud bursts into the open, intent on ramming you head on. You line up the enemy in your sights. You fire your cannon and watch him literally explode in the air. You've won this one - but watch out, there's another and another. Avenger - it's competitive. It's terrific!

FEATURES

- The first single-player game to feature three plays for two quarters which encourages the individual player to play a multiple series of games.
- By attaining "Avenger" rating player can gain Extended Play bonus, equal to one-third extra playing time
- Afterburner switch dramatically speeds thrust of the "Avenger" plane accompanied by exciting sound.
- "multi-Level" scoring racks up additional points based on flying speed.
- Joystick operation. Hand-contour joystick guides and controls speed. Trigger button activates "cannon."
- Three separate simulated sounds: aircraft roar with acceleration, explosion and cannon hit.
- People-attracting side graphics.
- Simple adjustment of game length.
- Large 23" Motorola monitor.

SPECIFICATIONS

Base dimensions - 24" x 26 1/2". Electrical - 115/230 V. 50/60 HZ operation. Shipping Weight - Approximately 275 lbs. Pricing - Quarter per play or 3 plays for 2 quarters.

Aztec

Manufacturer *PMC*
Release *1975*
Class *Wide Release*
Genre *Ball and Paddle*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Monitor
Orientation: *Either*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Unamplified Mono (requires one-channel amp)*
Cabinet Styles *Cocktail*

Aztec is a 4 player hockeytype Pongclone game in which players try to score in the opposing teams goal.

It is rumoured to be the first ever game to use processor chips instead of an array of TTL chips.

AZTEC

excerpt from the flyer:

- Imported copper laminated top
- Completely sealed against spills
- Lifts up and locks for easy servicing
- Cocktail table cast iron base, 10” floor clearance for foot room under unit
- Side entry service door
- Motorola monitor
- 2 or 4 players
- Electric counter

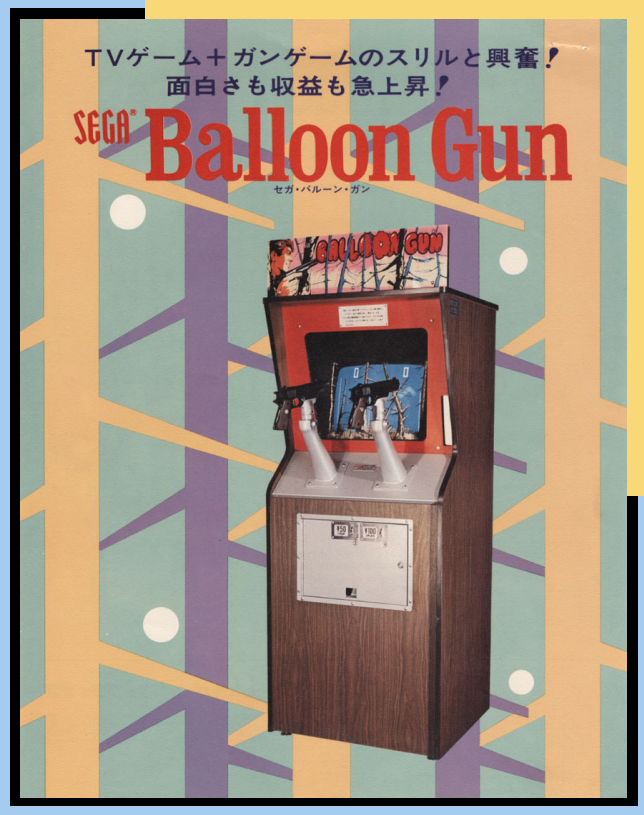
Balloon Gun

Manufacturer *Sega*
Release *1975*
Genre *Light-gun*
Mode *2 Players simultaneous*
Gameplay *Joint*
Panel Layout *Multiple Player*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Released by Sega in 1974, Balloon Gun was one of the earliest first-person light-gun shooter video games, and the first to feature multi-player gameplay. The game involved one or two players using light guns to hit various moving balloons displayed on the monitor.

Each player is given a limited ammo of 60 shots. In single-player mode, the game ends when that number has been fired. In two-player mode, the first one to use all 60 shots terminates the game for both players and the one with the highest score is determined the winner. The balloons initially appear slowly, allowing more time for careful aim, but as the game progresses, the balloons are released at a faster rate, making it more difficult to score.

“giantbomb.com”



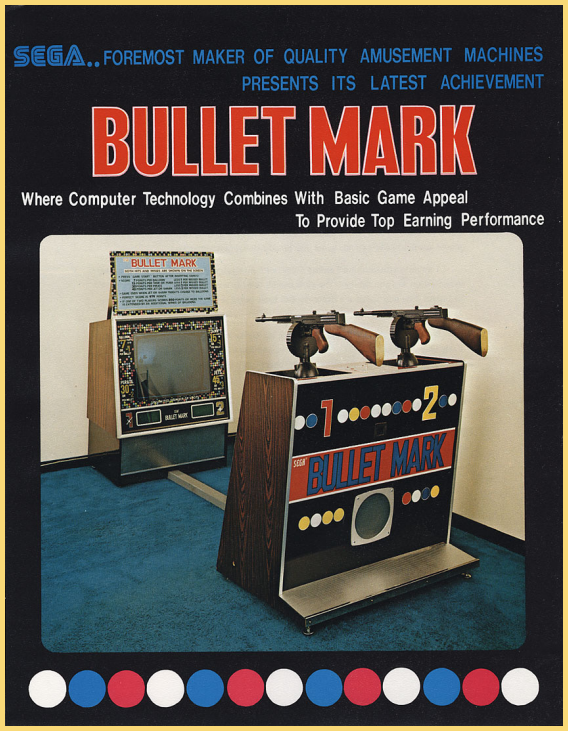
Bullet Mark

Manufacturer	*Sega*
Release	*1975*
Class	*Wide Release*
Genre	*Light-gun*
Mode	*2 Players simultaneous*
Gameplay	*Joint*
Panel Layout	*Multiple Player*
Sound	*Amplified Mono (one channel)*
Cabinet Styles	*Upright*

Bullet Mark is a 1975 discrete logic game by Sega with twin Tommy Guns.

The guns have a recoil effect and can be fired as a single shot or in a short burst. Four series of targets appear sequentially on an oversized TV screen: balloons (worth 7 points), tanks (15 points), pirates (30 points) and aircraft (45 points). A perfect score is 979. Game time is adjustable from 60 to 140 seconds. When played as a two-player game, a score of 800 (adjustable to 600 depending on the operator) by either player automatically extends the game into an additional balloon series.

"segaretro.org"



excerpt from the flyer:

Four series of targets appear sequentially on an oversized TV screen... balloons, tanks, pirates and jet aircrift. The easiest of the targets to hit are the balloons which are assigned a 7 points rating, followed by the tanks at 15 points, the pirates at 30 points and the jet aircraft at 45 points. For each hit, these points are recorded on a highly visible digital read out; for each miss however, 1 to 3 points (depending upon the target series) is subtracted from the player's score. Perfect score is 979. When played as a two player game, a score of 800 (can be adjusted to 600) by either player automatically extends game into an additional balloon series.

Two authentic-looking Tommy Guns, with a recoil effect like the real thing, are mounted on the gun cabinet. The guns can be fired as a single shot by each player or in bursts. The gun sights are accurate and each burst projects on the screen exactly as aimed by the player.

Six distinct sound effects match the six different targets which are available. Each players has his own set of Bullet Marks and sound effects in order to distinguish his bursts from that of the other player; and each player can easily see his hits and misses.

DIMENSIONS:
Height: Front 124cm (48"), Rear: 148cm (58.5"),
Width: Front 100cm (39") Rear: 83 cm (32.5")
Depth: 325cm (127") max. extension.

GAME TIME:
Adjustable from 60 seconds to 140 seconds.

SPECIAL FEATURE:
Two targets patterns can be changed through purchase and instillation of optional integrated circuit chip.

Crash ‘n Score

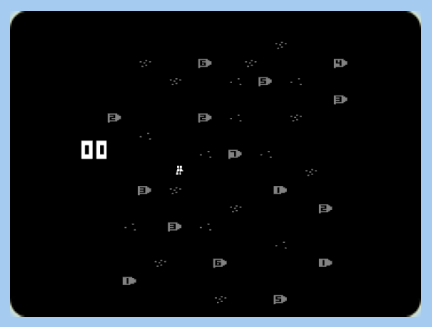
Manufacturer *Atari*
Release *1975*
Class *Wide Release*
Genre *Racing*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Steering: *Wheel*
Pedals: *1*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White with a Color Overlay*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

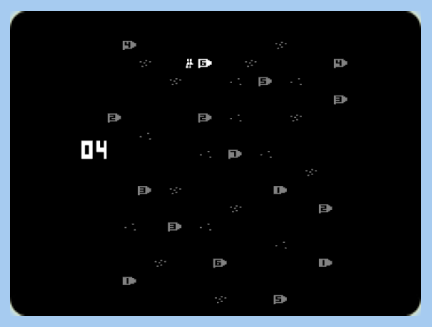
Crash ‘N Score is a 2 player arcade game by Atari, originally released in 1975.

Gameplay is a simulation of a demolition derby, in which player controls a car, and the goal, as the title suggests, is to crash into numbered flags and score the amount of points they are labelled as within the time limit. The goal flags flash white on the screen, and driving over other flags will cause the car to stop and slowly start up again. The flags pop up at random, and there are obstacles on the screen that will either cause the car to crash or swerve in another direction. In a two-player game, players can crash their cars into each other. The wall obstacles are optional. Travelling off the side of the screen causes the car to appear on the opposite side.

The game feature an attract mode, where the cars drive around by themselves while the game waits for one or two players to insert coins.

“mobygames.com”





excerpt from the flyer:

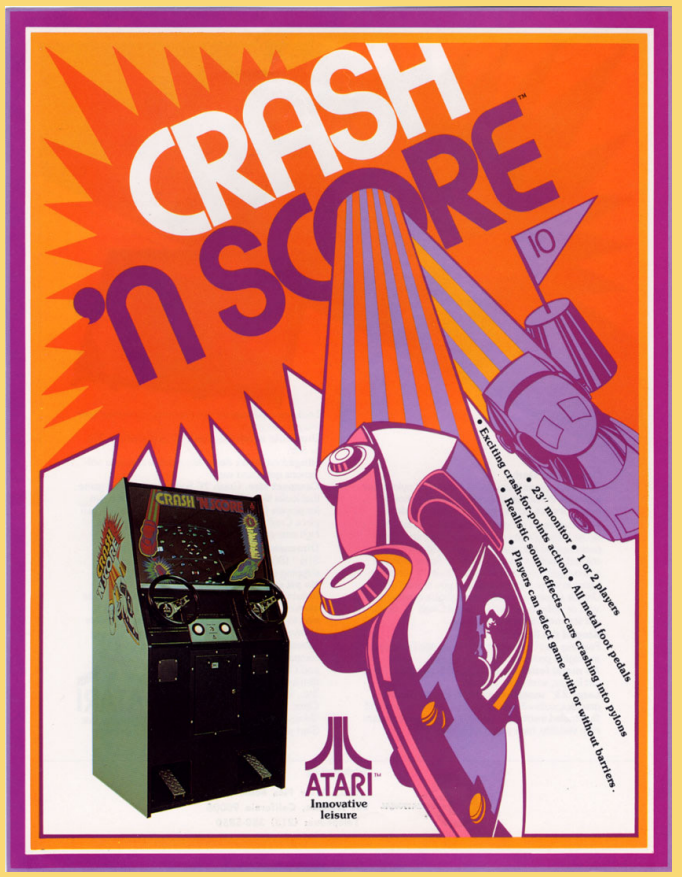
Demolition Derby
While each player trying to hit numbered pylons that pop onto the screen at random, player action is frantic. It’s like getting paid for fender-benders. Your customers get paid too, because Crash ‘N’ Score keeps players coming back for more. Compact physical size, exciting graphics (there are even colored overlays on the Crash ‘N’ Score monitor) and rugged construction make Crash ‘N’ Score at home in more locations, makes you a profit winner. Unique player-selectable game choice capability - with or without barriers - means Crash ‘N’ Score will stay new, always a challenge.

King of the Road
Features you can expect only from Atari make scoring higher profits as fast as an oil slick.

All metal foot pedals. Rugged accelerator pedals last longer, won’t lose contact.

Large 23” monitor, attention-getting cabinet graphics, colored pylon overlays on the screen and illuminated instruction panel (1 or 2 players) means high visibility, high player attention.

No pit stops to slow you down.
Durastress™ tested, solid state electronics leeps Crash ‘N’ Score always on the road.



Destruction Derby

Manufacturer *Exidy*
Release *1975*
Class *Wide Release*
Genre *Racing*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Steering: *Wheel*
Shifter: *2-position (forward, reverse)*
Throttle Lever
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (two channel)*
Cabinet Styles *Upright*

When released, Destruction Derby was unlike the host of other driving games on the market. While it had standard driving controls, the gameplay was anything but. Rather than a simple racing game Destruction Derby was a video version of the demolition derby in which a group of cars competed in an arena and tried to bash each other into pieces of useless wreckage. The last car that remained drivable was dubbed the "winner".

Initially produced by Exidy, the demand for Destruction Derby was so great that they licensed it to the floundering Chicago Coin who produced the game as Demolition Derby. As part of the deal, Exidy halted production of the game to avoid competing with their new licensee, but in the end, it didn't matter. At the time, Chicago Coin was already in the midst of the financial woes that would lead to bankruptcy in 1976 and when they were unable to make their royalty payments, Exidy was left holding the bag. While Exidy may not have seen much in the way of profit from the Demolition/Destruction Derby deal, the experience did result in a couple of very profitable decisions. First, seeing the sales success of the Chicago Coin title, Exidy decided that they would no longer license games to other companies. The second decision proved even more profitable. The 1976 game, Death Race...

"allincolorforaquarter.blogspot.no"

Demolition Derby

Manufacturer *Chicago Coin*
Release *1977*
Class *Wide Release*
Genre *Racing*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Steering: *Wheel*
Shifter: *2-position (forward, reverse)*
Pedals: *1*
Monitor:
Orientation: Horizontal
Type: Raster: Standard Resolution
CRT: Black and White
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*
Mini

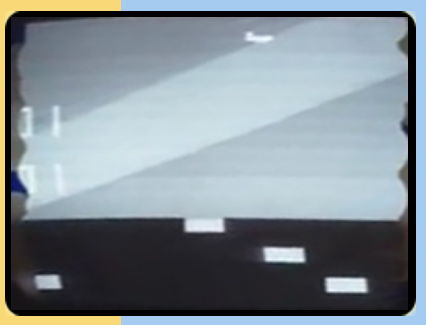
Drop Zone 4

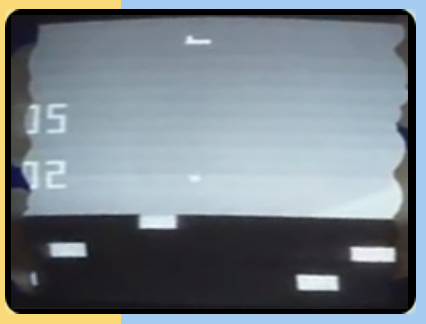
Manufacturer *Meadows*
Release *1975*
Genre *Action*
Mode *1 Player*
Gameplay *Single*
Panel Layout *Single Player*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White with a Color Overlay*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

The object of the game is to use the “Bomb Release” button to drop bombs from a moving jet to hit moving targets. Total of 15 bombs per game. The jet plane increases speed at 20 points and again after 30 points to test the skill of the player.

Players has optional HI/LO scoring for non-repeatable “game credit”. Scoring and misses are accompanied by visual and audio effects.

Drop Zone 4 is said to be the first video game to use only one button (excluding light gun games). “Drop Zone Bomber” may be another name seen for this.





Electra

Manufacturer *Electra Games, Inc.*
Release *1975*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *4 Players*
Gameplay *Alternating*
Panel Layout *Single Player*
Hardware *Discrete Logic*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Controls
Rotary: *Analog*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*
Table

Fascination

Manufacturer *Fascination, Ltd.*
Release *1975*
Class *Wide Release*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Hardware *Discrete Logic Monitor:*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Color*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*
Table

excerpt from the flyer:

FASCINATION, LTD. introduces the most revolutionary development in video table games - an “automatic electronic handicap” - tomorrow

Fire Power

Manufacturer *Allied Leisure Industries*
Release *1975*
Class *Wide Release*
Genre *Shooter*
Mode *2 Players*
Gameplay *Alternating*
Panel Layout *Single Player*
Controls
Joystick: *4-way (up, down, left, right) with button [Fire]*
Shifter: *2-position (low, high)*
Hardware *Discrete Logic*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Fire Power, released January, 19768(?) is a land versus air combat game where the player controls a tank that must shoot down enemy aircraft while avoiding minefields on the ground.

It may be one of the earliest video games to feature scrolling.

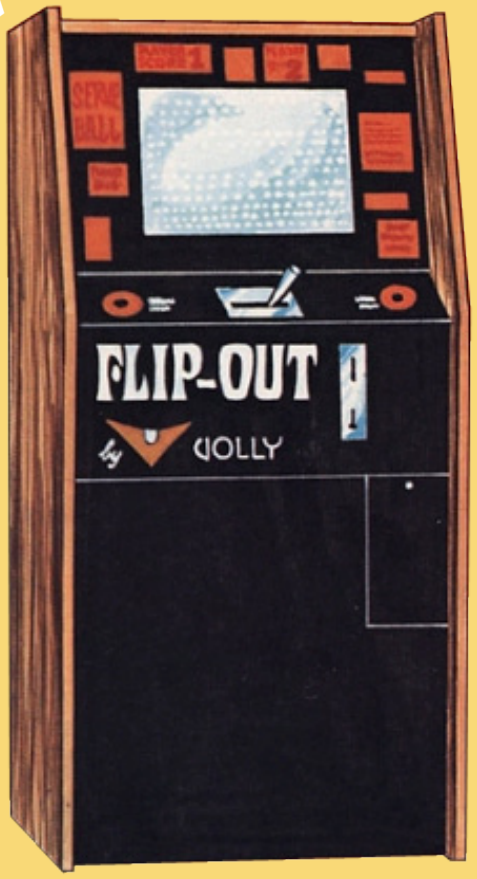
excerpt from the flyer:

FIRE POWER! The most complete tank fighter ever to shoot down enemy aircraft. You are on the ground trying to avoid minefields placed in your path. If you are caught in a minefield, you lose your FIRE POWER and can't shoot at enemy aircraft... but only temporarily. Once the tank is out of the minefield, you can speed up using your control lever, and start shooting down planes again. The faster your speed, the better your FIRE POWER and your score.

Flip-Out

Manufacturer *Volley*
Release *1975*
Genre *Video Pinball*
Mode *2 Players*
Gameplay *Alternating*
Panel Layout *Single Player*
Monitor
Orientation: *Either*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*
Cocktail

Flip-Out is Video Pinball by Volly For 1 or 2 Players. The game is played on a black and white display. The control panel includes two Paddles Knobs



excerpt from the flyer:

"A new sophisticated video game
to stimulate your profits"

A PROVEN WINNER - WITH A DIFFERENCE!
Take the upright model Flip-Out, the Video Game with Pin Ball Action. Transform it into a glamorous Cocktail Table model. Add a lively new feature that steps up the fun, and what have you got? Volly's new Flip-Out Cocktail Table, another game hit that will sustain player interest for a long time to come. Now a rebound shot not only returns from boundaries but zings back at players even from a dot. This abrupt deflection calls for greater alertness on the part of players and increases the thrills.

THE CHALLENGE GENERATES INCOME
Flip-Out calls for sheer motor skills and fast action. The competitive challenge to achieve a higher score keeps the quarters rolling in. And all the fever and excitement keeps the liquor flowing too.

IN TUNE WITH EVERY LOCATION INTERIOR
The Flip-Out Cocktail Table harmonizes with any decor. Its vibrant blue glass top, padded bar finish and dazzling medallions on the decorator panels of the cabinet make it an elegant piece of furniture. The lighting is subtle. The glass top is tempered, and is sealed to prevent leakage to the inside.

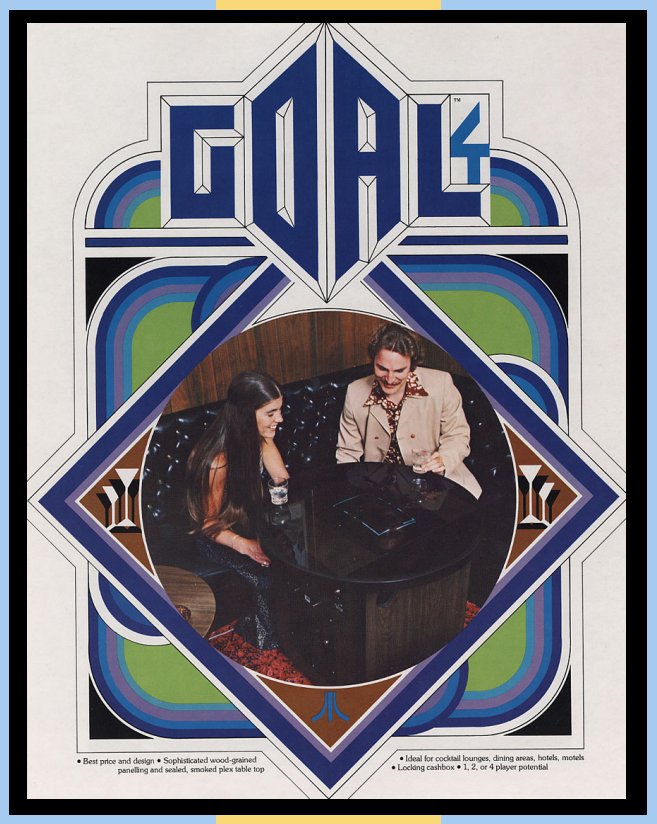
UNIQUE MODULAR DESIGN
Flip-Out's modular design spells rapid and easy servicing. Each part is a plug-in module that can be replaced individually.

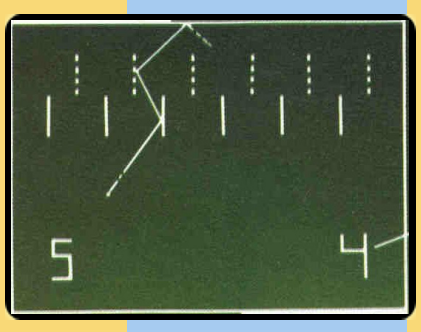
DIMENSIONS

Height	28"
Diameter	33"
Weight	105 lbs.

Futsball

Manufacturer *Allied Leisure Industries*
Release *1975 - 1979*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Monitor:
Orientation: *Vertical*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Controls
Joystick: *Analog*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Table*



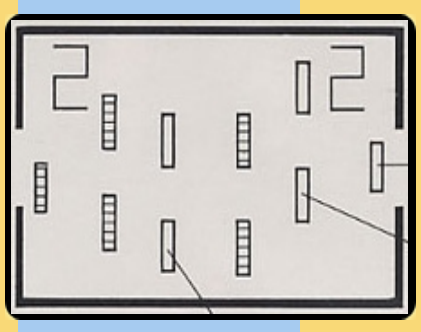


Allied's Futsball is a two-player head to head ball-and-paddle game where each player uses a 2-way joystick to shift column of paddles left and right to bounce and pass the ball to score points against the other player.

The game is a video version of foosball and came in an innovative stand-around cabinet.

Goal IV

Manufacturer *Atari*
Release *1975*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *4 Players simultaneous*
Gameplay *Team*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Controls
Rotary: *Analog with push-down button [Kick]*
Monitor:
Orientation: *Vertical*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Conversion Class: *Atari BW Raster*
Cabinet Styles *Upright*
Cocktail



Goal/4 is a foosball game. The gameplay depends on how many players there are. In a single-player game, the player tries to kick the ball into the goal, which moves back and forth. In multiplayer mode, each side has one goalie and two forwards. The forwards each move back and forth and can kick the ball offensively or defensively, and the goalie defends the goal from the ball. If there are four players, each side has one player controlling the goalie and one player controlling the two forwards.

"mobygames.com"

Gun Fight

Manufacturer *Midway Manufacturing Co.*
Release *1975*
Class *Wide Release*
Genre *Shooter*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Hardware *Midway 8080*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White with a Color Overlay Uses a yellow overlay*
Sound *Amplified Stereo (two channel) Each Player has its own sound channel, Player 1 left, Player 2 right*
Cabinet Styles *Upright Cocktail*

Gun Fight, known as Western Gun in Japan and Europe, is a 1975 arcade shooter designed by Tomohiro Nishikado, and released by Taito in Japan and Europe and by Midway in North America. It was the first video game to depict human-to-human combat, while the Midway version was also the first video game to use a microprocessor.

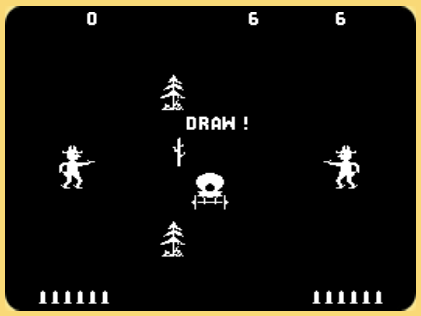
Western Gun is a fixed screen shooter where two players could compete in an old west gun fight. When shot, the characters in the game fell to the ground and the words "GOT ME!" appeared above the body. The game had two distinct joystick controls per player, with one eight-way joystick for moving the computerized cowboy around on the screen and the other for changing the shooting direction. Unlike other dual joystick games, Western Gun has the main joystick on the right instead of the left.

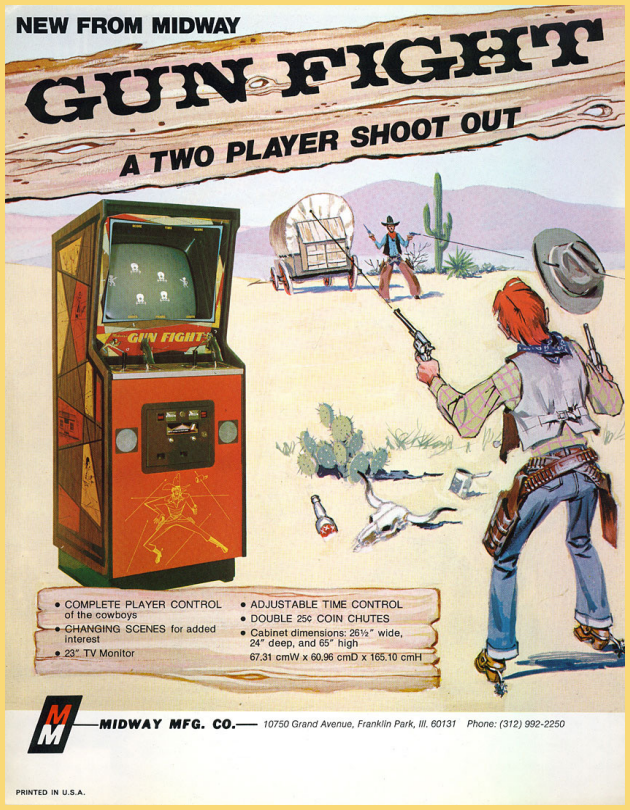
Other features of the game included obstacles between the characters which block shots, such as a cactus, and (in later levels) stagecoaches. The guns have limited ammunition, with each player given six bullets; a round ends if both players run out of ammo. Gunshots can also ricochet off the top or bottom edges of the playfield, allowing for indirect hits to be used as a possible strategy.

Taito gave Western Gun artwork of cowboys in the Wild West on the video game arcade cabinet which matched the in-game graphics featuring cacti, covered wagons, rocks, and human characters. The game use bitmapped framebuffer technology to display animated human-like characters, using Fujitsu's MB14241 video shifter chip, which was also later used by Sea Wolf and Space Invaders. Tiles are also used to display text.

Taito licensed its game Western Gun to Midway for release in North America, one of the first such licenses, after the 1974 scrolling racing game Speed Race, also designed by Tomohiro Nishikado, and the 1974 sports game Basketball. The title Western Gun, while making perfect sense for Japanese audiences in that it conveys the setting and theme as simply as possible, was considered to have sounded odd to American audiences, so it was renamed Gun Fight instead for its American localization.

Tomohiro Nishikado's original Western Gun design was based on discrete logic, like most video arcade games of the time. When Dave Nutting adapted it for Midway, he decided to base it on the Intel 8080, which made Gun Fight the first video game to use a microprocessor, since his company Dave Nutting Associates had already licensed the technology for the first arcade pinball machine to include a microprocessor, The Spirit of '76. Nishikado believed that his original version was more fun, but was impressed with the improved graphics and smoother animation of Midway's version. This led him to design microprocessors into his subsequent games, including the blockbuster 1978





shoot ‘em up hit Space Invaders. Gun Fight uses a black-and-white raster monitor and a yellow screen overlay.

In 1978, the game was introduced to the home market with its port to the Bally Astrocade console, which included a color version of the game within the system’s ROM. That same year, David Crane programmed his own version of the game, entitled Outlaw, released by Atari for the Atari 2600 console and by APX for the Atari 8-bit computers. Sears also released a version for the Atari 2600 called Gunslinger that year. In 1981, the game was ported to the Atari 8-bit family personal computers by Hofacker/Elcomp Publishing. The game was included in Game-Spy’s “Hall of Fame” in 2002.

Cocktail version

Western Gun

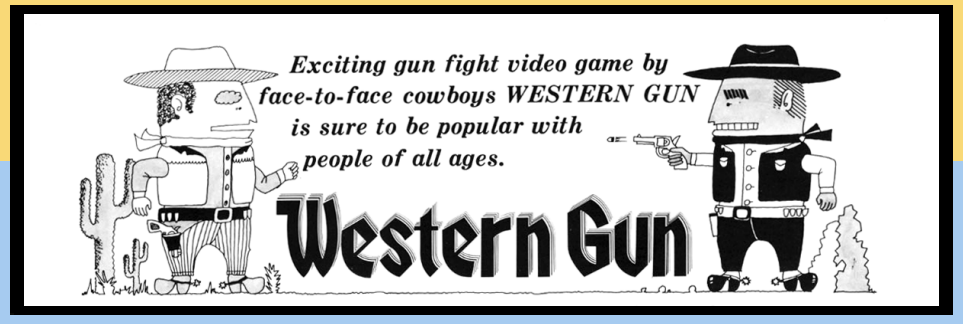
Manufacturer *Taito*
Release *1975*
Class *Wide Release*
Genre *Shooter*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player Ambidextrous*
Controls
Joystick: *8-way with button [Shoot]*
Joystick: *Special*
[Changes shooting direction]
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Western Gun was Taito’s original Japanese version, also released in Europe, while Gun Fight was Midway’s North American adaptation. There are differences between Western Gun and Gun Fight:

The original Western Gun was the first open-world video game, the first action-adventure video game, and the first real-time tactical cover shooter. The two cowboy gunslingers had free-roaming movement across a single-screen open-world environment, littered with cacti and mountains that could be used as cover, while attempting to shoot each other. However, Western Gun had more primitive sprite graphics and animation, and used discrete-logic hardware (lacking a microprocessor).

The North American version Gun Fight introduced a microprocessor, allowing more detailed larger sprite graphics and smoother animation, but limited the gameplay. In Gun Fight, each player’s movement was limited to their own side of the screen, whereas the original Japanese Western Gun had free-roaming movement across anywhere on the screen. Gun Fight also reduced the scale of the environment, with mountains no longer being present.

In the 1978 hit movie Dawn of the Dead, Peter and FlyBoy are playing the game at the mall. Peter loses as the allusion of Flyboy is bad shooter in real life.



Hi-Way

Manufacturer *Atari*
Release *1975*
Class *Wide Release*
Genre *Racing*
Mode *2 Players*
Gameplay *Alternating*
Panel Layout *Single Player*
Controls
Steering: *Wheel*
Shifter: *2-position (low, high)*
Pedals: *1*
Monitor
Orientation: *Vertical*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

excerpt from the flyer:

Go out in the traffic and play! Hi-Way is completely new generation in driving games. Designed for spectacular realism, Hi-Way puts your players literally in the driver's seat in the middle of speeding traffic.

Watch the road! Your skill and nerve is challenged every second. You climb in, your quarter fires it up. You step on the gas... excitement builds higher and higher as you fight to keep your car on the road (which is constantly moving every-which way under your wheels!) and avoid crashing head-on into traffic as you try to pass slower cars.

You're driving against the clock (it's operator adjustable) to pile up as many miles as possible, so you have to be sharp... and quick! Look out for that curve!

Shut down the competition! You have a winning set of wheels with Hi-Way. Indestructible moulded fiberglass chassis, detachable "bucket" seat, reliable Durastress™ tested solid state circuits and monitor, and all-metal gas pedal make you the king of the road.

Ideal for arcade play, bowling alleys - you name it. Hi-Way's a profit winner any way you look at it.

You're in the driver's seat. Follow the Atari highway into the future - and big dollars. Get the jump on the daily gran prix.

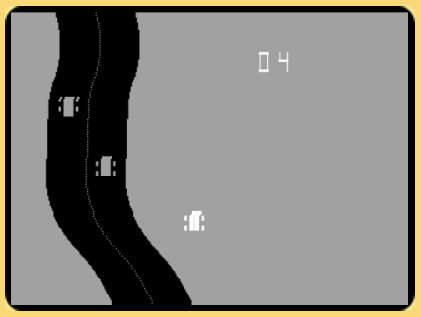
"Hi Way — All It Needs Is Wheels"

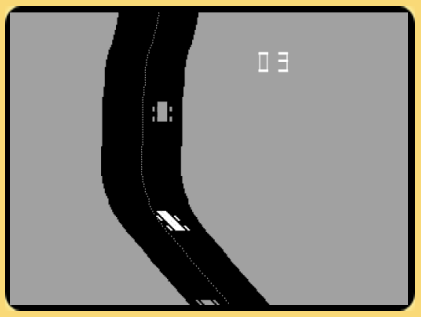
Hi-Way is a driving arcade game. The game has the simple goal of driving a car down a road, staying on the road, and avoiding other cars. If the player crashes, they will be momentarily stopped. The car can drive off-road, but it's extremely slow. The score awarded depends on the distance the car travels.

This was Atari's first sit-down driving game. The game hardware is a pre-cpu discreet logic design, and used the Durastress process. The cabinet was patented Oct. 20, 1975: (U.S. Patent # D243,626,).

"mobygames.com"

hi·way





Dimensions:
Height 55", 139.7cm;
Width 23.25", 81.92cm;
Lenght 73.75", 187.33cm

- The ultimate driving experience
- Rugged, molded fiberglass construction
- 23" Durastress™ video monitor
- New all-metal gas pedal assembly
- Ideal for arcades, bowling alleys, etc.
- Realistic sound effects

Indy 800

Manufacturer	*Kee Games*
Release	*1975*
Class	*Wide Release*
Genre	*Racing*
Mode	*8 Players simultaneous*
Gameplay	*Competitive*
Panel Layout	*Multiple Player*
Controls	
Steering: *Wheel*	
Buttons: *1 [Horn]*	
Pedals: *2*	
Monitor	
Orientation: *Horizontal*	
Type: Raster: *Standard Resolution*	
CRT: *Color*	
Sound	*Special Sound System*
	Amplified 8 channels
Cabinet Styles	*Upright*

Indy 800 is an 8 player arcade game by Atari, originally released in 1975.

Gameplay is a simulation of an Indianapolis 500 style race, in which players compete by racing each other with simulated IndyCar race cars. The players race blocky cars around a simple track with a top-down overhead view. The player car colors are purple, peach, yellow, green, light blue, white, red and dark blue.

The game is housed in a large custom rectangular cabinet that takes up 16 square feet (1.5 m2). Each side of the cabinet has two steering wheels and four pedals. The monitor is set in to the top face of the cabinet and looked down upon. The game uses a 25 inch full color RGB display and does not use color overlays.

The processing electronics consist of a card cage that includes a “Backplane” or “Motherboard”, eight identical car function boards, and three unique, common processing boards that the backplane board supports and interconnects. Each of the eleven boards has its own onboard fixed 5 volt regulator IC. All of the logic circuitry is TTL, and no microprocessors are used.

Each game was sold with two spare car boards and one each of the three processing boards, so that the game owner could repair it by simple circuit board substitution. Two “card extender” boards were furnished with each game sold that enabled technicians to probe individual components on suspect boards while they were still operating in the game. A complete set of circuit board logic diagrams was also furnished, as was a set of schematics for the modified GE color monitor.

The cabinet also features overhead mirrors to allow spectators to watch the game while it’s being played.

A clone of the game, bearing the same name, was released by Atari subsidiary Kee Games. Indy 800 was also followed up the following year with a smaller 4 player version entitled Indy 4. A scaled down version of Indy 800 was a launch title for the Atari 2600 in 1977, renamed Indy 500.

excerpt from the flyer:

Designed for rugged competition. Now, up to 8 players (or any combination) can drive the Big One. True big car racing action, the thrill of wheel to wheel competition, the whine of engines and squealing tires add up to big crowds and repeat play! (Nobody can resist coming back for another chance to win!).

Gentlemen, start your engines... and your profits! Players drop the quarters. Each driver grabs his steering wheel, carefully lines up for the start... ready... in less than a heartbeat... the race is on! The red is ahead... no, now the yellow. Look out! The blue car is going into a controlled skid...

Rugged steel foot pedals for gas and brakes challenge timing and skill around hairpin turns. Watch out for that wall!

Special feature: Indy 800 includes a complete set of back-up components for easier maintenance.

Occupying only 16 square feet, Indy 800 assembles or disassembles easily for simple access to any locations.

Jet Fighter

Manufacturer *Atari*
Release *1975*
Class *Wide Release*
Genre *Shooter*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Joystick: *8-way with button [Fire]*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
a coloured overlay is used to simulate clouds, placed directly over the screen.
Sound *Amplified Stereo (two channel)*
Cabinet Styles *Upright*

Jet Fighter is a 2 player arcade game by Atari, originally released in 1975.

The players fly in simulated jets around the screen, engaging in an dogfight and attempting to score hits on their opponent within a limited amount of time. When a player is hit, their plane spins around and an explosion is heard. After a few seconds, the plane recovers, pointing at a random direction.

The game is housed in a custom cabinet that includes two 8-way joysticks (one per player) meant to look like older style flight sticks. Each stick has a fire button mounted on the top. The marquee simply has a picture of the back of a pilot in a cockpit, firing a missile at what looks like an exploding Russian Mig. The monitor bezel is mainly decorated with clouds, with the words 'Jet Fighter' at the top of the bezel above the screen. The side art was silk-screened, in big letters below the picture, a mirror of the marquee picture, but with a few extras.

A clone of the game, bearing the same name, was released by Atari subsidiary Kee Games. Also, a home console port was included in the Atari 2600 game cartridge Combat.

excerpt from the Service Manual:

PHYSICAL DESCRIPTION OF GAME

Atari's Jet Fighter is a video game in which players pilot two airplanes across the sky in a fast-moving duel. The game is packaged in its own upright cabinet that rests directly on the floor. A 19-inch black-and-white TV monitor is mounted at the top front of the cabinet and players stand in front, facing the screen. A realistic sky effect is provided by the distinctively-styled cloud graphics that surround a square-shaped playfield on the TV screen.

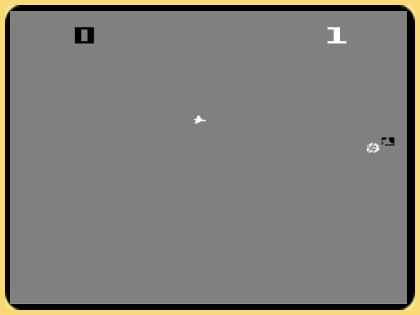
The player-operated controls, mounted on a horizontal flat panel near the bottom of the TV screen, consist of two joysticks and two backlighted push button switches. A coin assembly with two identical coin mechanisms is located below the player-operated controls. The mechanisms accept quarters only, and coins deposited in either one can initiate play. The Jet Fighter game features an owner/operator-adjustable option that permits on-site game structuring for either 1 player/coin or 2 players/coin. The cash box is located behind the access door in the coin assembly.

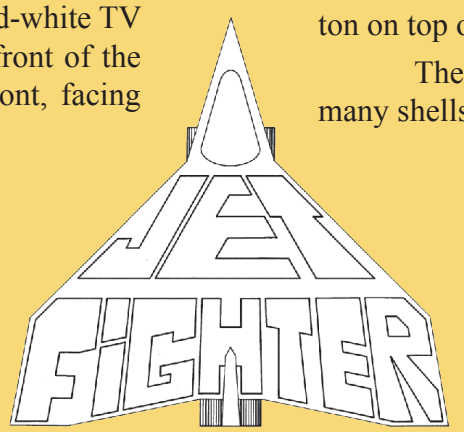
Two speakers mounted inside the cabinet, one on each side of the coin assembly, add to the game excitement by producing jet engine, gunfire and explosion sounds during play.

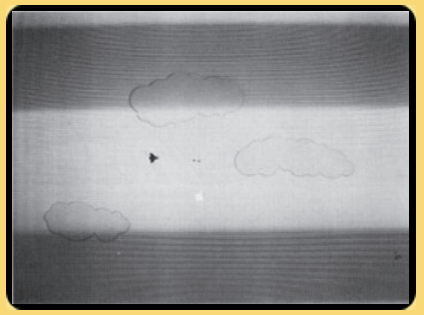
BRIEF DESCRIPTION OF PLAY

In the Jet Fighter game two delta-winged fighters - one white plane and one black plane - fly across the TV screen, each plane trying to hit the other with its shells. Jet Fighter can be played by either one or two players: with one player the white plane is piloted by the player and the black plane by the game's internal computer, and with two players each plane is piloted by a player. The player controls his plane's speed and direction by moving his front panel joystick lever, and fires a shell by depressing a push button on top of that lever.

The player's objective is to fire as many shells as possible into the opponent's



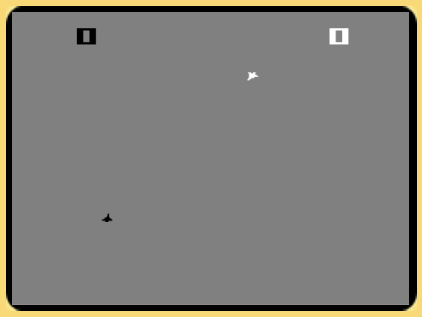




plane, while at the same time manoeuvring his own plane to avoid shells fired by the opponent. After coin deposit the duel begins when a start button is depressed. A plane can fire only one shell at a time and the shell explodes when it hits the opponent's plane, or when it has travelled over a distance equal to about three-fourths of the width of the playfield. If a player's shell hits the opponent's plane, that plane explodes and spins around very rapidly. After a few seconds the hit plane recover and flies off in some randomly chosen direction, and the duel resumes.

One point is added to player's score each time the shell from his plane hits the other plane. The accumulated scores for both planes are displayed continuously on the TV screen.

Along with this video action, the following sounds are heard during play. The speaker on the left side of the cabinet produces the black plane's engine roar, and the speaker on the right produces the white planes's roar, continuously during play. The engine sound is at low pitch when the plane's speed is slow, at medium pitch when the speed is medium, and at high pitch wheen speed is fast. In addition, both speakers produce a blast noise whenever either plane fires a shell and whenever any shell explodes by itself. An explosion noise, twice as loud and twice as long as the previous noise, is produced by both speakers whenever a shell hits a plane.



Play ends when the game timer elapses (the Jet Fighter game features and owner/operator-adjustable option that permits on-site structuring of the game time). At this point, the planes continue to fly, but maintain the speeds and directions they held at the moment the game ended. The final scores continue to be displayed, but there is no sound and the joysticks are inoperative. A player depositing a coin will initiate a new player sequence.

excerpt from the flyer:

Mach II Action

Jet Fighter is a brand new air combat game, the latest from Atari, #1 in video games. Jet Fighter puts your players in the middle of a split-second one-on-one air battle, your customers in the stratosphere of higher profits.

Highflying Features

Exclusive Atari performance features and built-in appeal let you seek and destroy the competition with higher nets, more location action.

Realistic joysticks, fire control buttons put each player in his own cockpit, his own real aircraft.

Large 19" monitor, bright scratch-resistant graphics, easy-to-read interchangeable 1 or 2 player instruction panels make Jet Fighter attract players wherever it is. A specially designed removable attraction panel with long-lasting fluorescent lighting lets you visually tailor Jet Fighter to fit any location.

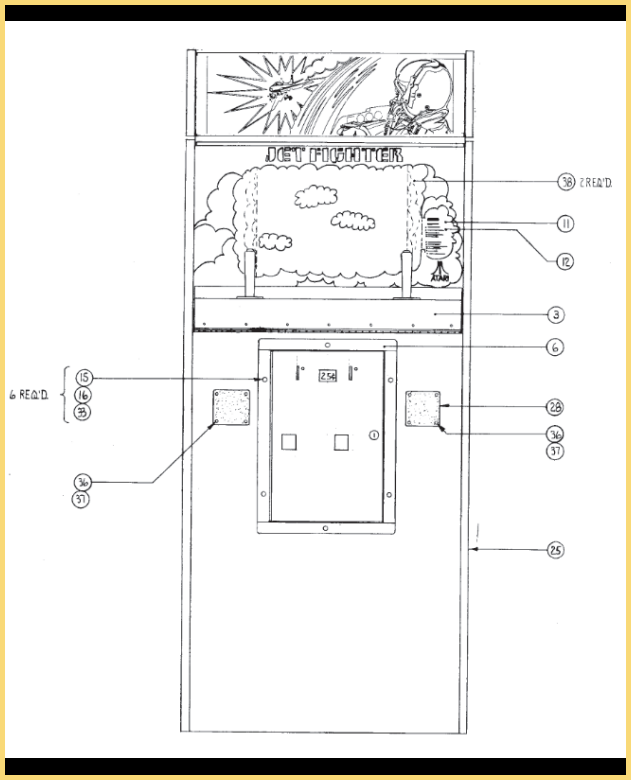
Twin coin chutes (25¢ or 50¢ for two players).

Hinged cash door for easy access to collections.

Locking cashbox means no-loss security.

Long range strike capability Jet Fighter is built and engineered to stay in the air. Durastress™ tested, solid-state circuit reliability means minimum down-time, less frustration for players and your customers.

3	*Control Panel Assembly*
6	*Coin Door Housing Assembly*
11	*Instruction Card*
12	*Instruction Card*
15	*#10 Flat Washer*
16	*#10-24 Hex Nut*
25	*Side Panel, S/Screen Layout, R.H.*
28	*Speaker, Aluminum Mesh*
33	*Carriage Bolts, #10 - 24 x 1 1/4 Lg.*
36	*Rivets, 3/16 x .68*
37	*Mushroom Caps*
38	*Cloud Decal*



Knock Out

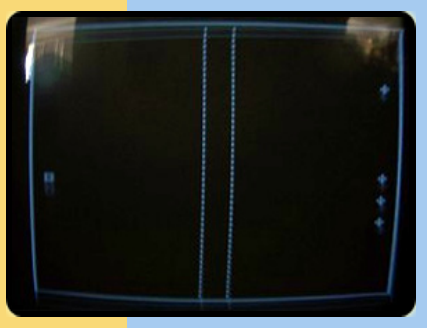
Manufacturer *Digital Games Incorporated*
Release *1975*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *4 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Monitor
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Cocktail*

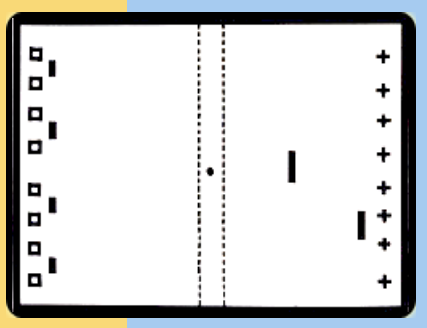
Knock Out is a 1 to 4 player tabletop ball and paddle game.

The game run on discrete circuitry. I has a 19" solid state monitor, illuminated coin switch and side mounted knobs.

excerpt from the flyer:

Features Include:
- Full Factory Warranty
- Durable Construction
- 19" Motorola Monitor
- Side Mounted Knobs
- $500.00 Locking Coin Vault
- Illuminated Coin Switch
- .25/.50 Cent Play
- Electric Coin Counter
- 110/220 Volt 50/60 Hertz
- Weight 150 Lbs.





Maneater

Manufacturer *Project Support Engineering*
Release *1975*
Class *Wide Release*
Genre *Platform*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player Ambidextrous*
Controls
Joystick: *Analog*
Sound *Unamplified Mono (requires one-channel amp)*
Cabinet Styles *Upright*

"Get your teeth into a Maneater Video Terror from PSE The bite will be profitably tasty!"

Maneater was produced by Project Support Engineering in 1975.

In the game, players control a diver to collect gold from the bottom of the ocean and return it to the ship, while avoiding the man-eating sharks.

The enclosure is a metalflake, fiberglass formed, white cabinet in the shape of a sharks head. The nose is pointing skyward with the mouth open. The monitor sits in the top of the mouth and the bottom of the mouth holds the control panel. The game and cabinet was obviously inspired by the movie JAWS.

Pace Car Pro

Manufacturer *Allied Leisure Industries*
Release *1975*
Class *Wide Release*
Genre *Racing*
Mode *4 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Joystick: *8-way Monitor:*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Color*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Pace Car Pro is a four-player, high-speed car racing game where each person uses a joystick to control the speed, direction and brakes of his or her car.

The game was one of the first games to use a color monitor, an actual color TV set.

Electra Games was the coin-op video game division of URL (who later developed for Stern). Pace Car Pro was their first game.

excerpt from the flyer:

Electra Games presents the newest of the Electronic Video Games - but from a company that is one of the "oldest" in producing TV game electronics. "Pace Car Pro" is new in design, new in concept and has features never before designed into a video game.

• Features the industry's first "Robot", a pace car that travels at a constant, predetermined rate of speed, against which the player(s) compete
• "Pace Car Pro" is the first four-car competitive racing game.

Ric-O-Chet

Manufacturer *Allied Leisure Industries*
Release *1975*
Mode *4 Players*
2 Players simultaneous
Gameplay *Competitive*
Panel Layout *Multiple Player*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

"Ric-o-chet
It's an experience..."

Ric-O-Chet is a 2 to 4 player ball and paddle game from Allied Leisure. The game feature court lines on top and bottom of screen to eliminate dead spots. The start button eliminates instant serve.

excerpt from the flyer:

2 Players for 25¢
4 Players for 50¢

Both FRONT and BACK COURT Play!!

• Court lines on top and bottom of screen eliminates dead spots
• Start button eliminates instant service
• Positive stops on control knobs - cut down excessive wear on potentiometers
• 21 inch Solid State T.V. allows all spectators to participate in action
• 12 mos. warranty on video board

Robot

Manufacturer *Allied Leisure Industries*
Release *1975*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Hardware *Discrete Logic*
Controls
Joystick: *4-way (up, down, left, right) with button*
Joystick: *4-way (up, down, left, right) with button*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

"Robot plays against itself"

Robot is a two-on-two ball and paddle game where each player controls two paddles and tries to get the ball past the opponent's goal.

excerpt from the flyer:

As a constant display, Robot plays against itself. Robot plays against 1 player (25¢) OR 2 players (50¢) OR 2 players can play against each other (25¢) OR 2 teams (4 players) can play against each other (50¢). 25¢ or 50¢ adjustable.

Robot features a 23" TV screen with a solid state monitor, a 3 month warranty on the video board, and an easy care wood grain formica cabinet. Dimensions: 36" deep, 30" wide, 66" high -weight 250 pounds.

Robot's play is on an adjustable timer with no maximum score. If a player(s) scores 12 points against Robot, he gets extended play. Each handle controls a video player, the velocity button on top of the handle controls the arch of the ball. The player can pass, dribble, or hit the ball to his partner of opponent.

Shark

Manufacturer *US Billiards*
Release *1975*
Class *Wide Release*
Genre *Labyrinth/Maze*
Mode *4 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Buttons: *Directional (up, down, left, right)*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White with a Color Overlay*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*
Cocktail

"You're the Shark!"

Shark was produced by US Billiards in 1975. Players control a shark who must swim through a maze of shark traps and nets and attack a swimmer before she reaches the shoreline. The first shark to eat five swimmers wins.

Shark JAWS

Manufacturer	*Atari*
Release	*1975*
Class	*Wide Release*
Genre	*Platform*
Mode	*2 Players*
Gameplay	*Alternating*
Panel Layout	*Single Player*
Controls	
Joystick:	*8-way*
Monitor	
Orientation:	*Horizontal*
Type: Raster:	*Standard Resolution*
CRT:	*Black and White with a Color Overlay*
Sound	*Amplified Mono (one channel)*
Cabinet Styles	*Upright*

excerpt from the flyer:

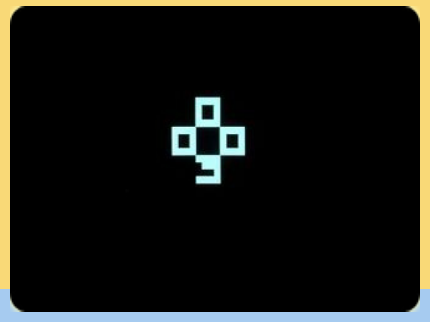
HOW IT'S PLAYED

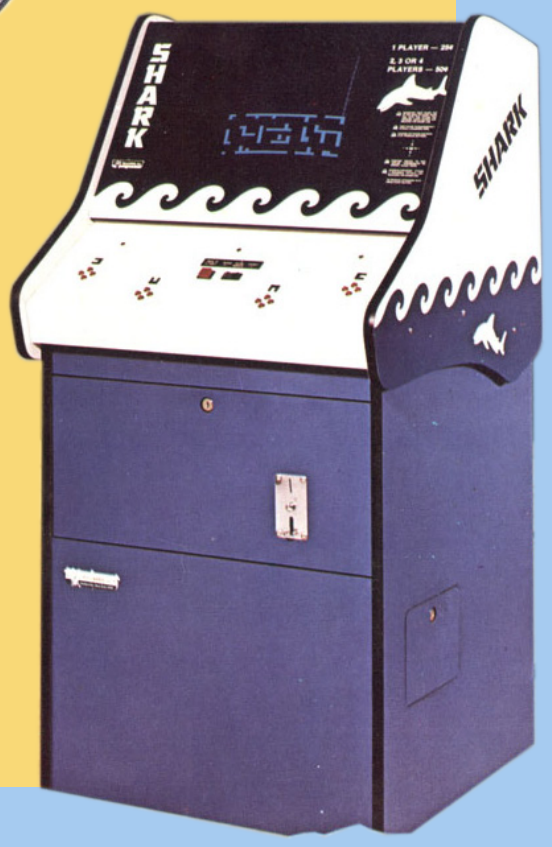
• Maneuver your Shark out of the maze of Shark Traps and Nets and Attack the Swimmer above before she reaches the shoreline.
• First Shark to Successfully attack 5 Swimmers wins.
• Choose any Shark and move it by pressing buttons.
• Position switch to give "Novice", "Intermediate" or "Expert" Shark traps.
• In "One Player" mode, Attack 5 Swimmers without any reaching the shoreline.
To receive Extended Play, press Start button.

HOW IT'S BUILT

• 1 Player - 25¢
• 2, 3 or 4 Players - 50¢
• Large 19" Screen 100% Solid State Motorola Monitor and Tilt Back Cabinet Design Permit easy Play and Spectator Visibility.
• Adjustable game duration
• All Solid Mica Cabinet
• Isolated Locked Cash Box
• Easy Serviceability and Access to All Parts
• Puch Button Controls mean Trouble-free Operation

Cocktail Table

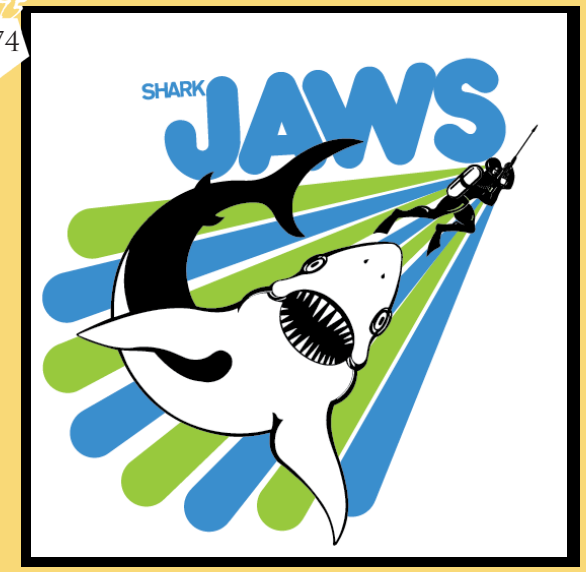


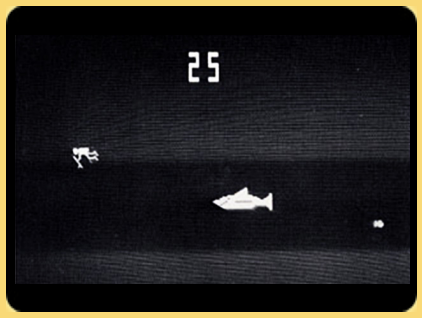


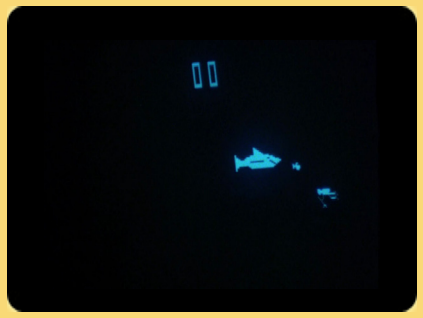
Shark Jaws is a single-player arcade game by Atari Inc. under the name of Horror Games, originally released in 1975. An unlicensed tie-in to the movie Jaws, and believed to be the first commercially released movie tie-in, it was created to do a game about sharks eating people. Atari head Nolan Bushnell originally tried to license the Jaws name for the game, but was unable to secure a license from Universal Pictures. Deciding to go ahead with the game anyway, it was re titled Shark JAWS, with the word Shark in tiny print and JAWS in large all caps print to create greater prominence. Bushnell also created a second hidden subsidiary corporation, Horror Games—the previous being Kee Games, to help isolate Atari from possible lawsuit. According to Bush, the game was successful enough to sell approximately two thousand units.

The player controls a deep-sea diver trying to catch small fish while avoiding a great white shark that is trying to eat him. Points are scored by running over the fish to catch them.

The game is housed in a custom cabinet that includes a single joystick and start button. The cabinet bezel uses blue and green colors, and portrays sharks swimming around along with a solitary swimmer. The game PCB is composed of discrete technology, and although the game was released under Horror Games the PCB clearly states Atari.







excerpt from the flyer:

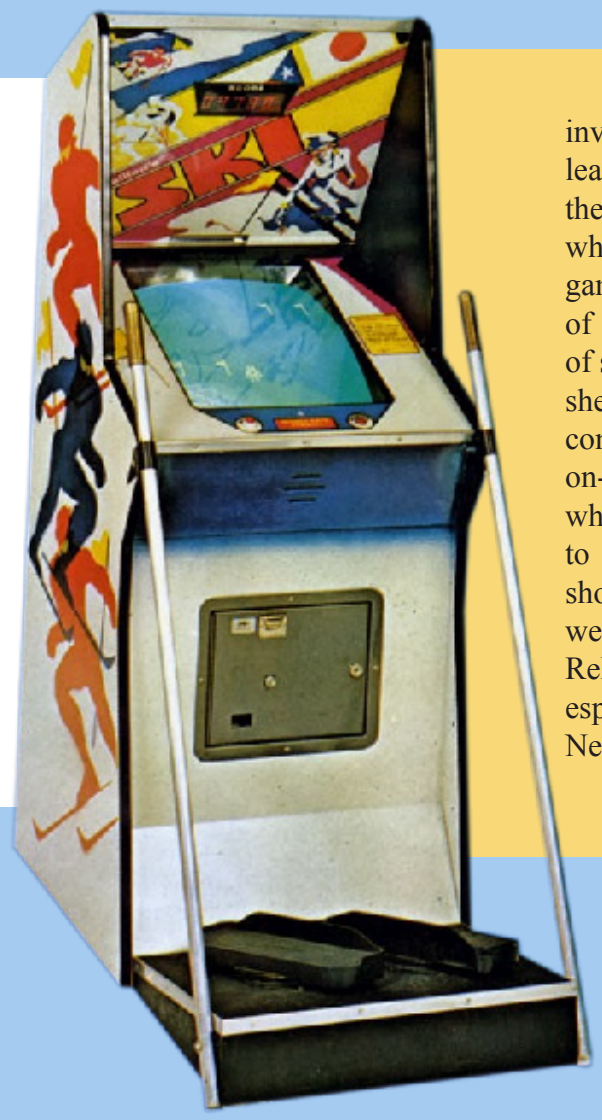
Gulp!
Now you and your locations can cash in on the popularity, interest and profits associated with sharks. Shark JAWS is a completely different, **all new** video concept. Its small size and attractive, long-wearing panel graphics make Shark JAWS an ideal 1-player addition to **any** location environment. **Killer.** Exclusive Atari built-in features consume the competition, put extra teeth into earnings. **Large 19" Monitor.** The face of Shark JAWS is covered with an eerie blue overlay to simulate an underwater environment, add to the excitement. **Attention-getting cabinet.** Graphics (double andoized on teh control panel for long wear) are designed to instil terror and attract the braver players wherever they swim. Players can't resist flirting with disaster at the jaws of the underwater predator.

Joystick control lets the diver try to spear fish, save himself from being eaten.
Locking cashbox holds the coins watertight
Hinged cash door, key operated, allows for ease of collection.
Operator-adjustable game time lets you control the profits.
Unlimited Action. Shark JAWS is built to stay in action. Durastress™ tested circuits, built-in solid state reliability means less down-time, less service hassle, more continuous income.

Rugged vinyl-clad plywood construction, easy access to internal components, fast 24-hour parts response keeps the income non-stop.
Dimensions: Height 53 3/8" (135.6cm). Width 25 1/4" (64.1cm). Depth 23 1/2" (59.7cm). Shipping Weight 196 lbs. (88.98kg).
Be the first in your ocean. Order your Shark JAWS while there's still time to get away.

Ski

Manufacturer *Allied Leisure Industries*
Release *1975*
Class *Wide Release*
Genre *Sports*
Mode *1 Player*
Gameplay *Single*
Panel Layout *Single Player*
Controls
Steering: *Special*
[Foot-controlled skis.]
Monitor
Orientation: *Vertical*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
with a Color Overlay
Sound *Amplified Mono*
(one channel)
Cabinet Styles *Upright*



Ski was one of the more inventive of the video games released in the late 1970s (though there is some question as to whether it actually was a video game). The player stood on a pair of footpads while gripping a pair of ski poles. By twisting her body she could move the footpads and control the direction in which the on-screen skier was travelling while the ski poles could be used to control speed. As the player shooshed down the slopes, they were serenaded by alpine music. RePlay reported that the game did especially well in ski resorts in New York.

"allincolorforaquarter.blogspot.no"

Steeplechase

Manufacturer *Atari*
Release *1975*
Class *Wide Release*
Genre *Sports*
Mode *6 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Buttons: *1 [Jump]*
Game Specific: *Steeplechase Pinout*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
with a Color Overlay
Sound *Amplified Mono*
(one channel)
Cabinet Styles *Upright*

Steeplechase is a 6-player arcade game by Atari Inc., originally released in 1975. Developed by Atari subsidiary Kee Games, it simulates a steeplechase-style horse race.

Originally called AstroTurf, all pcb's still have the name on the board. The game is housed in a custom extra wide cabinet that six individually colored and lit buttons used to make a player's horse jump. The monitor is a 23" black and white CRT monitor with 6 color overlays to make each of the 6 horizontally stacked lanes match their colored button counterparts. Sounds include a bugle, galloping hoof beats, and crowd cheers.

Up to six players can play against each other, each choosing a horse while the computer controls the seventh horse on the bottom. Each player's horse begins galloping, and the players must jump over obstacles in their lanes by pressing their colored buttons. The horse that successfully jumps all obstacles smoothly becomes the fastest horse and wins.

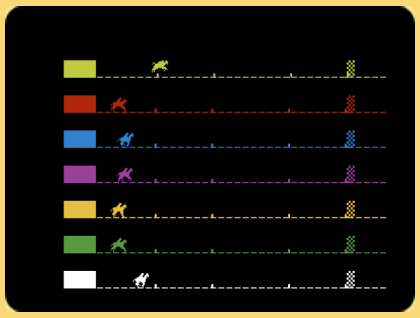
A port for the Atari 2600 was released under the same name in 1980. It was programmed by Atari and distributed under Sears' Tele-Games.

ATARI Steeple chase!

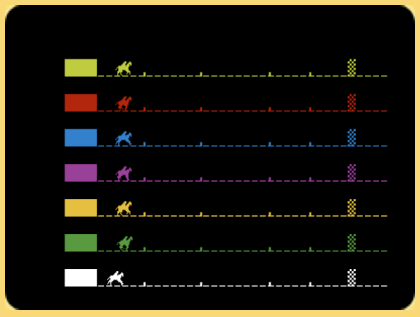
The cabinet for the european version was made by Löwen-Automaten. The cabinet is a little wider than usual to allow enough space for six large buttons, one for each player. The game was produced by Kee Games and sold by Atari.

excerpt from the flyer:

“Riders up”
Steeplechase is designed to build extra traffic anywhere and keep the cheering sound of up to 6 quarters per race loud and long. Trained by Atari, number one in video games, Steeplechase has all the competition excitement of the real thing, plus the profit potential.
A Horse of a Different Color.
Steeplechase is a completely **new** video concept - the only video game of its kind. Usual Atari exclusive features are built-in to make you and your customers leading money winners.
2, 4, or 6 player potential. Steeplechase is designed for high volume action and repeat play. Six colored overlays for each racing lane, lighted control buttons for each rider that match the colors each track, and realistic steeplechase sound effects keep players and spectators coming back to try for top jockey plaudits. Special stakes, Dally Doubles, feature races - you can help your locations organize a wide variety of racing events to boost earnings even higher.



Large 23” monitor and attractive cabinet graphics add to the excitement of play. Steeplechase stands out anywhere.
Steeplechase won’t fade in the stretch.
Install it and forget it. Exclusive Durastress™ tested circuits; reliable, long-wearing solid state electronics; rugged vinyl-clad cabinet construction. Steeplechase keeps on earning furlong after furlong.



Stock Car

Manufacturer *Atari*
Release *1975*
Class *Wide Release*
Genre *Racing*
Mode *6 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Monitor
Orientation: *Either*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

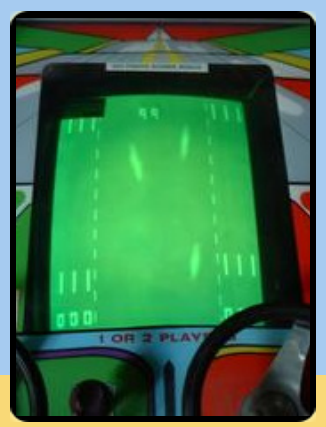
Stock Car is a modified European version version of Crash ‘n Score.

excerpt from the flyer:

1 OR 2 PLAYERS WITH A FREE PLAY ADJUSTABLE
Each player drives a car which goes across the field in between oil slicks and barriers in order to hit the flashing flags. The first car which crash the flashing flag scores from 1 to 7 pts depending on the value of the flag, during the last 20 seconds the target’s values double **like A FLIPPER.**

Street Burners

Manufacturer *Allied Leisure Industries*
Release *1975*
Class *Wide Release*
Genre *Racing*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Steering: *Wheel*
Shifter: *2-position (low, high)*
Pedals: *1*
Monitor
Orientation: *Vertical*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*



Street Burners is a vertical car racing game from Allied Leisure. It feature a 23” inch TV screen with a solid state monitor.

Super Flipper

Manufacturer *Chicago Coin*
Release *1975*
Class *Wide Release*
Genre *Video Pinball*
Mode *1 Player*
Gameplay *Single*
Panel Layout *Single Player*
Controls
Flippers: *Analog (left, right)*
Monitor
Orientation: *Vertical*
Type: Raster: *Standard Resolution*
CRT: *Black and White with a Color Overlay*
Blue overlay with pop bumpers, sling shots, etc. imprinted on it.
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Super Flipper is a video game disguised as a pinball machine. It was the first video pinball, with real flipper buttons, ball shooter and pinball cabinet. The flipper button switches are optical controls - a lamp and a photocell are separated by a sliding part with a hole in it: flipper travel depends on how much the flipper button is pressed. The flippers are actually paddles moving left and right in the same manner as traditional video games of the period.

The machine feature a numitron tube score display (a type of digital display that uses segmented digits in a vacuum tube). Playfield is a black and white monitor viewed through blue plastic overlay with graphics on it. Monophonic sound. The game has gravity simulation. There is no shooter alley. The ball starts play by moving left and right across the playfield. Pulling and releasing the ball shooter sends the ball downward into play.

The playfield layout (not the overlay) is similar to the one on Model Racing’s ‘UFO’.

“ipdb.org”

Survival

Manufacturer *US Billiards*
Release *1975*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Monitor
Orientation: *Either*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Cocktail*

Survival is a 1 to 4 player ball and paddle game from US Billiards. The game is similar to Atari's Quadrapong.

The game feature:
• 1, 2, 3 or 4 Players
• Free Game Option
• 19" Motorolla Monitor
• Electrical Counter
• Isolated Cash Box
• Joystick Controls
• 1 Quarter for 1 Player Against House or 2 Players Against Each Other
• 2 Quarters for 3 Players Against House or or 4 Players Against Each Other

Take 7

Manufacturer *Fun Games Inc.*
Release *1975*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *4 Players simultaneous*
Gameplay *Either*
Panel Layout *Multiple Player*
Controls
Rotary: *Analog*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Two one-inch square overlays: "Deposit additional coins for 4 players" and "Extended Play"
Sound *Amplified Mono (one channel)*
Cabinet Styles *Cocktail*

Take 7, produced by Fun Games in 1975, is a ball and paddle game that feature seven varieties of video table tennis.

Take 5

Manufacturer *Fun Games Inc.*
Release *1975*
Class *Wide Release*
Genre *Ball and Paddle*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Cocktail*

Take 5, produced by Fun Games in 1975, is a ball and paddle game that feature five different table tennis games.

WIPE OUT (SINGLE)
One Player

WIPE OUT
Two Player
or Four Player

MATCH
Two Player
or Four Player

PRO MATCH
Two Player

GRAVITY MATCH
Two Player
or Four Player

Tank III ...maybe?

Manufacturer *Kee Games*
Release *1975*
Class *Wide Release*
Genre *Labyrinth/Maze*
Mode *2 Players*
Gameplay *Alternating*
Panel Layout *Single Player*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Tank III was produced by Kee Games in 1975 and is the third in the series of tank games.

Many believe that the game was never made and does not exist, based on the nonexistence of evidence and the sparsity of mentions.

Tankers

Manufacturer *Fun Games Inc.*
Release *1975*
Class *Wide Release*
Genre *Labyrinth/Maze*
Mode *2 Players*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Joystick: *2-way (left, right)*
Joystick: *2-way (up, down) with button [Fire]*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Cabinet Styles *Upright*

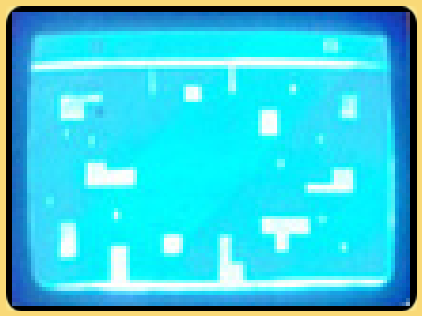
Tankers is a maze/battle game where each player controls a tank and tries to destroy opposing tanks in a maze of mines and barriers. The game is seen as a clone of Atari's Tank.

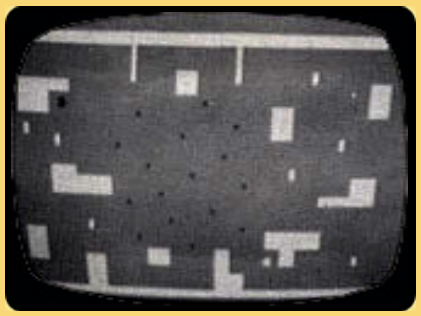
excerpt from the flyer

Combat-ready. You're ready for any kind of action with new TANKERS. Your mission is to seek and destroy the enemy - but watch out for the mines. Suddenly, cannon fire from the enemy tank! You turn, line up for a return shot - fire! It's a miss! Shoot! You've got to get him before he gets you. Another shot! This time it's a hit! - the enemy tank blows up. You've won! You can't relax though. Within operator-adjustable game time, you have to score as may hits as possible to win the battle.

Battle-tested. TANKERS is built to see heavy action. All solid state circuitry, fully tested I.C.'s, a full year warranty on the computer board and rugged construction keep TANKERS a profit winner day after day. Attractive low profile cabinet design means TANKERS is a winner in any location, too.

Behind-the-lines support - in 24 hours! TANKERS is built to stay in the fight. Replacement and repair parts are available on a 24 hour schedule - anywhere. Ease of access for maintenance and easy access to coin box means consistent earnings without problems.





TV Flipper

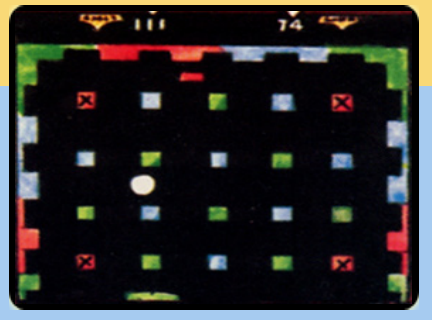
Manufacturer *Midway Manufacturing Co.*
Release *1975*
Class *Wide Release*
Genre *Video Pinball*
Mode *2 Players*
Gameplay *Alternating*
Panel Layout *Single Player*
Hardware *Midway 8080*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Color*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

"A T.V. Game with All the Excitement of Pinball"

TV Flipper is a video pinball game from Bally Midway.

excerpt from the flyer:

- Large size solid state T.V. monitor
- 1 or 2 player game
- "Extra ball" or "replay" feature
- 3, 4 or 5 balls per game
- Double 25¢ coin chutes
- Cabinet dimensions 26 1/2 x 24 x 64



UFO Chase

Manufacturer *Electra*
Release *1975*
Class *Wide Release*
Genre *Space*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Joystick: *8-way*
Buttons: *1 [Fire]*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

UFO Chase is a space battle game where each player controls a UFO and tries to ram or destroy an opposing UFO to score points.

The game is divided into six time intervals; during each interval, only one of the UFO's can attack, the other must evade. This action starts with the Black UFO and alternates between the two UFO's. During this interval, the attack UFO can score points by firing missiles or ramming the evading UFO. Two random motion Asteroids moving about the screen substract points from the attacking UFO if they hit it.

"It's Combative...
Competitive...
Sensational..."

excerpt from the flyer:

Picture two armed space vehicles locked in mortal combat. The attack UFO roars into the 'sky', seeks out its adversary, rams him, sends him reeling downward then bombs him from above. That's "UFO Chase" the sensational new Electronic Video Game by Electra.

- "Double Action" chase alternates players.
- Random motion "asterioids" penalize offensive player when struck
- Offensive player can score either by ramming or bombing

Video Action

Manufacturer *UPL*
Release *1975*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *4 Players Simultaneous*
Gameplay *Either*
Panel Layout *Multiple Player*
Controls
Rotary: *Analog*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
The top glass that the monitor shown through was tinted yellow
Hardware *Discrete Logic*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Cocktail*

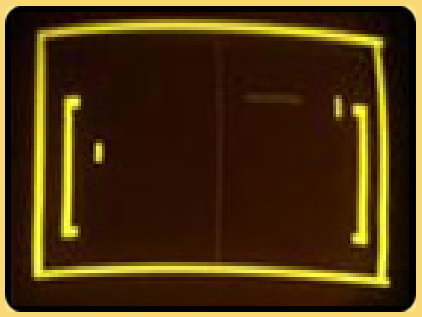
excerpt from the flyer:

A QUALIYT STORY

Video Action's parent company, Universal Research Laboratories, is a pioneer in the video games industry having produced literally tens of thousands of solid state logic boards during the last five years. Integrated circiut components are 100% computer inspected, the put through a rigorous freeze/heat testing procedures called "thermal cycling". The result is a remarkably low percentages of field problems.

Video Action allowed two or four players to play tennis, soccer, or hockey. Pong style variants of each game.

The game has an octagon table top, with a vinyl padded base (so users wouldn't bang their knees on the cabinet).



- Three-game mode: Tennis, Soccer, Hockey
- Pricing: 25¢ for Two players, 50¢ for Four Players (Quarters Only)
- Fast or Slow "Speed Action"
- Solid State TV Monitor
- Lighted, Easy-to-Locate Coin Entry Slot
- High-Impact, Tampered Glass Window
- Seperately Keyed Cash Box, $300 capacity

CABINET FEATURES

- Handsome Styling
- Sturdy Construction
- Aluminium Diecast Base
- Durable High-Pressure Laminate Top
- Upholstered Sides

Video Pool

Manufacturer *US Billiards*
Release *1975-1976*
Class *Wide Release*
Genre *Billiards/Pool*
Mode *2 Players*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

"4 Different Pool Games in 1 Durable Cabinet"

Video Pool is a black and white game of billiards.

excerpt from the flyer:

2 Proven Money-Makers - The Super-Popular Game of Pool and the Modern Format of Video Games. A Sure-Fire successful combination.

SPECIFICATION:

- 1 or 2 Players
- 19" Motorola Monitor
- Electrical Counter
- Isolated Cash Box
- Push Button Controls mean Trouble-free Operation.

Wheels II

Name: Wheels II
Manufacturer: Midway Manufacturing Co.
Year: 1975
Type: Videogame

Class: Wide Release
Genre: Racing
Monitor:

Orientation: Vertical
Type: Raster: Standard Resolution
CRT: Black and White

Conversion Class: unique

Maximum number of Players: 4
Control Panel Layout: Multiple Player
Controls:

"WHEELS II
Exciting one or two player race game"

excerpt from the flyer:

- Speed shift controls
- Adjustable timer feature
- Accelerator pedals
- Engine sound effects
- 25¢ per play
- Extended play
- Cabinet dimensions
  29"W x 32"D x 65 3/4"H
  73.66cmW x 81.28cmD x 167.01cmH
- Approx. weight in carton 320 lbs. 145.15 kg.
- 23" Motorola Solid State TV Monitor
- Seat optional

excerpt from the Lo-Profile flyer:

- Cabinet dimensions
  29"W x 32"D x 52"H
  73.66cmW x 81.28cmD x 132.08cmH
- Approx. weight in carton 300 lbs. 136.08 kg.

Wheels II, sequel to Wheels (1974-1975), is a single or double player game containing no microprocessor. Players race their cars against computer cars, gaining points for elapsed distance before time runs out. Crashing requires the player to shift into low gear to start again (2 speeds).

Each player races on his own side of the screen, against computer generated obstacle cars. The players' cars move farther up the screen the faster they go. Players cannot cross into each other's lanes. If one player crashes, their side of the screen stops while the other player drives on normally. The crashed player must downshift in order to accelerate at a reasonable rate. Each player's car is slightly different, but the computer cars are all the same.

The control shifters have 8-ball ends. The marquee is made of real glass. Steering wheels are three-spoked chrome.

"arcade-museum.com"

280 ZZZAP

Manufacturer *Midway Manufacturing Co.*
Release *1976*
Class *Wide Release*
Genre *Racing*
Mode *2 Players*
Gameplay *Alternating*
Panel Layout *Single Player*
Hardware *Midway 8080*
Controls
Steering: *Wheel*
Shifter: *2-position (low, high)*
Pedals: *1*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Datsun 280 ZZZAP or 280 ZZZAP is an early racing arcade game by Midway designed by Jay Fenton. It was announced as one of the first 3-D driving games.

The game didn't start out as Datsun 280ZZZap — it started out as a game called Midnite Racer, made by Midway. The problem was that Midnite Racer was a copy (though licensed) of a Micronetics game called Night Racer (that may be a copy of a German driving game called Nürburgring).

On top of all this, Atari would very soon release their licensed knockoff, Night Driver, creating a glut of pseudo-3D, drive-between-the-white-fenceposts racing games out there.

Midway noticed exactly this at the November 1976 AMOA (Amusement and Music Operators Association) show, which featured all the indistinguishable night-driving games in one place. After the show, in an effort to have their game stand apart from all the others, Bally-Midway started a promotion that would give away a brand new 1977 Datsun 280Z, and worked out a deal with Nissan that allowed them to rename the game Datsun 280ZZZap (sometimes just 280ZZZap) and include images of a 280Z on the marquee and case.

The game also stood out by using Midway's unique mirror-based projection system that could overlay static, printed images on top of the primitive raster-scan graphics of the game. Since the simple, 8080-based computer running the game could only display blocky black and white images, the mirror-projection system was used to overlay a night sky and the hood of a yellow 280Z on the screen. The 'dashboard' section of the screen also had a woodgrain bezel around it.

The game was also notable for the big, pixellated words it would display when players crashed, like BANG and BOOM and most notably, ZORK. ZORK was notable not just because it's possibly the least likely sound for a car to make when running into a post at high speed, but also because 'Zork' was the name of a popular text-based adventure game of the era. Since Zork was first written in 1977, there's some speculation the name came from the game, but it may just be a coincidence as the word was in widespread use in geeky communities already.

Datsun doesn't seem to have done too much on their end to publicize this video game tie-in, though in 1977 Datsun did offer a 'special decor package' for the 280Z called the 280ZZ-Zap, which was a Sunburst Yellow 280Z with rear window louvers and black hood and roof stripes, and a multicolored side stripe kit.

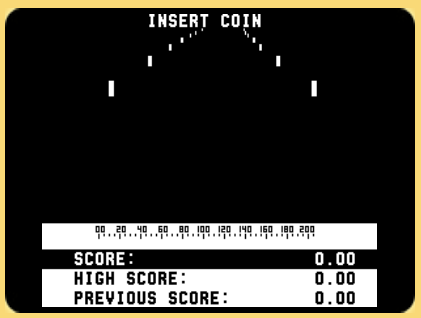
The ZZZap edition did seem to roughly mirror what the car in the videogame looked like, though there doesn't seem to be any official mention of the game in Datsun's ads.

"Jason Torchinsky@jalopnik.com"

excerpt from the flyer:

"Thrilling action matches skills against tight bends... fast straights... S-curves & more for real driving excitement!"

- Realistic Engine, Crash & Accelerator Sound Effects
- 3- Dimensional Driving Game with High & Low Gear Shift
- Constantly Changing Race Course
- High Score of the Day Feature
- Adjustable Extended Play



Ace

Manufacturer *Allied Leisure Industries*
Release *1976*
Class *Wide Release*
Genre *Shooter*
Mode *2 Players*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

"go ahead... take control"

Ace pits two biplane pilots in head-to-head air combat, in a 2-player only game. Players just need to fly around and shoot down the opponent before he gets the player. There are 2 points awarded for hitting the enemy with the gun, and 1 point to the opponent if the player crash.

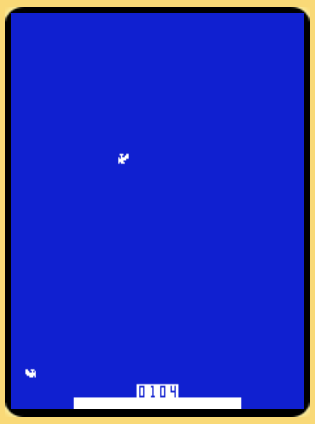
excerpt from the flyer:

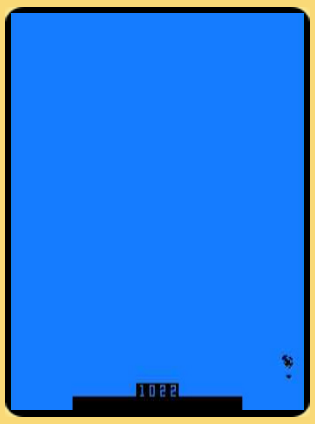
ACE controls, that is, for fun and profits!!! ACE, the 2-player video gun game sure to be a triple asset to your location.

PLAYER APPEAL... 2 opposing planes take off quickly. ACE generates more excitement in the air with multiple firing capacity (You don't have to wait until the first shot goes off the screen). ACE's rapid-firing trigger button gives the player speed, accuracy, and more in-the-air play time for his money.

SKY-HIGH PROFITS... ACE joins the long line of Allied Leisure Industries' proven money makers. Test results show ACE far superior in earning power to its nearest competitor. You can "take control" of your profits with this consistently competitive game.

VIVID DESIGN... to catch the eye of the player; compact for easy installation in any location: 30" deep, 28" wide and 69" high - weight 255 pounds.





Air Combat

Manufacturer *Digital Games Incorporated*
Release *1976*
Class *Wide Release*
Genre *Shooter*
Mode *2 Players*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Joystick: *8-way*
Joystick: *8-way with button [Fire]*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

AIR COMBAT

"2 PLAYER - REALISTIC SOUND AND CONTROL"

An air battle game where a player controls a jet fighter that tries to shoot down an opposing jet fighter.

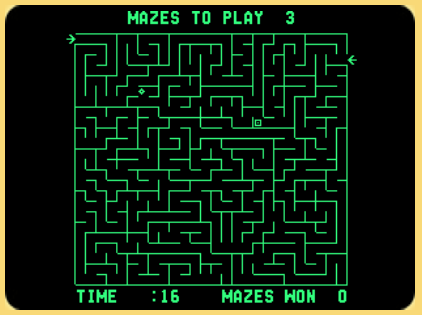
excerpt from the flyer:

New Features
- .50 Cent Play
- 2 Player
- Realistic Sound
- Joystick Control
- Play Meter (Coin Counter)
- 23" Solid State Monitor
- Locking Coin Vault
- 1-Year Warranty on Logic Board and Monitor
- Extended Play

Amazing Maze

Manufacturer *Midway Manufacturing Co.*
Release *1976*
Class *Wide Release*
Genre *Labyrinth/Maze*
Mode *2 Players*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Joystick: *4-way (up, down, left, right)*
Buttons: *3 [AttackJumpNinjutu]*
Hardware *Midway 8080*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Amazing Maze, referred to as The Amazing Maze Game on the title screen, is an arcade game that was released by Midway Games (in 1976); it utilizes the Intel 8080 microprocessor running at 1.9968 MHz and is one of the earliest maze games produced.



The maze is viewed from above and the players start out on each side of the labyrinth. The objective is then simple: Each player has to make it through the maze to the starting position of the opponent before he does the same in the opposite direction. Before starting out the player has a few second to study the maze before it starts. When not having a human opponent around it's also possible to play against an AI. When playing against the AI the game goes on until the player has lost three games. For each new maze the AI speed increases. In a two player game there's a time limit and the player with most wins when it runs out is the winner. The layout of the maze is randomly generated before a game and according to the manufacturer there are more than a million different patterns.

"mobygames.com"

Attack is an early first-person light-gun shooter arcade video game, released by Taito in 1976.

The game is a 2-player competitive shooting gallery. Both players have a mounted machine-gun with swivel aiming. The goal is to destroy as many passing trucks (worth 10 points each) as possible within the 90 seconds of one credit. If either player scores 300 points an additional 90 seconds of playtime will be added. Trucks can drive onto the screen from both sides of the screen, and trucks farther away are smaller and harder to hit.

"mobygames.com"

Attack

Manufacturer *Taito*
Release *1976*
Class *Wide Release*
Genre *Light-gun*
Mode *2 Players*
Gameplay *Joint*
Panel Layout *Multiple Player*
Controls
Gun: *Positional with trigger*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

ATTACK

A NEW AIR-SEA COMBAT ACTION GAME/INTENSE PLAYER INVOLVEMENT

A GAME OF FUN & SKILL

FEATURES

TWO PLAYER VIDEO ACTION, UNIQUE SOUND EFFECT, REALISTIC ACTION

ADJUSTABLE TIME CONTROL

EASY TO OPERATE SINGLE JOY-STICKS

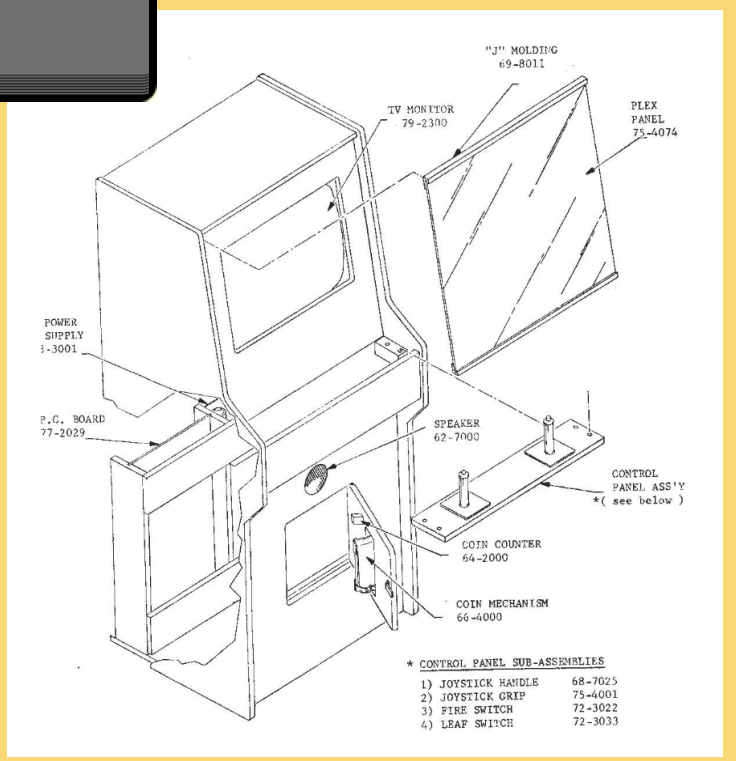
SOLID STATE MONITOR
ONE YEAR WARRANTY ON LOGIC BOARDS

DIMENSIONS
H - 63¾"
W - 27"
D - 27½"
SIZED RIGHT
A GREAT LOCATION AND ARCADE PIECE

Exidy inc.
2599 GARCIA ave. Mt. View
CA. 94043 (415) 968-7670

Attack

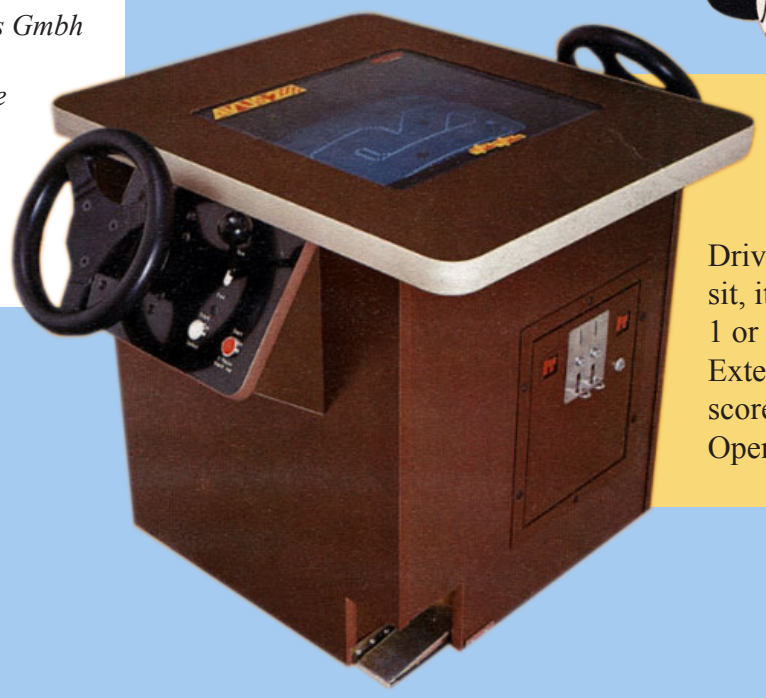
Manufacturer *Exidy*
Release *1977*
Class *Wide Release*
Genre *Shooter*
Mode *2 Players*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Joystick: *4-way (up, down, left, right) with button [Fire]*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

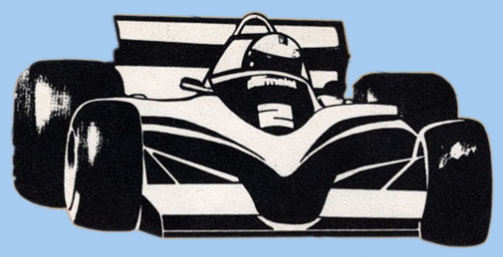


Exidy's Attack is a re-release of Taito's Attack. The light-guns is replaced by joysticks.

Avus 2

Manufacturer *Video Games Gmbh*
Release *1976*
Class *Wide Release*
Genre *Racing*
Controls
Steering: *Wheel*
Cabinet Styles *Cocktail*





AVUS 2

excerpt from the flyer:

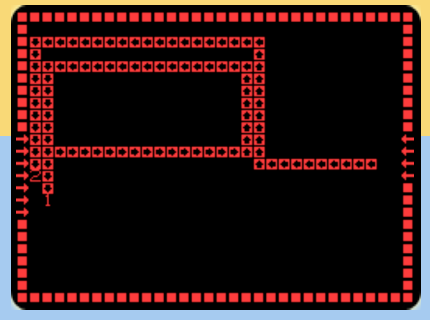
Driving games are played all times, and when you sit, it is even more fun.
1 or 2 players can select one of 12 tracks.
Extended play is awarded after a pre-programmed score is reached by the driver.
Operator adjustable extended play and game time.

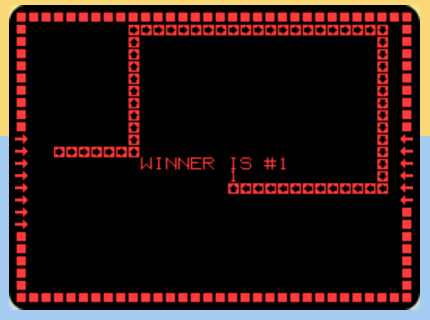
BARRICADE

Barricade is an early example of a light cycle game for arcades. Barricade is intended for either two or four players. Each player controls an ever growing wall made up of individual small squares. These walls are growing on a fixed playfield of limited size, therefore room will eventually run out for these growing walls. So the goal of the game is to win a round by forcing the other players wall to collide into themselves or another barrier.

The operator of the arcade machine can set the number of rounds it takes to win (from one to seven) and set how fast or slow the speed at which the walls grow (there are seven different speed options).

"mobygames.com"





Barricade

Manufacturer *Ramtek*
Release *1976*
Class *Wide Release*
Genre *Skill*
Mode *4 Players*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Buttons: *Directional (up, down, left, right)*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Batter Up

Batter Up is a baseball game from Volley.

excerpt from the flyer:

PLAYER APPEAL
Challenge will last, with unlimited pitching variations, "soft" buttons for precision player action — all the moves of real baseball.

DYNAMIC STYLING
High image cabinet and front glass — colourful stadium — plastic play field overlays video screen.

ADVANCED DESIGN
Most inventive engineering yet evolved by Volly — modular design feature easy to remove modules mounted on slide out tray. P.C. Boards are gold edged and mounted in unique rubberized tension assembly for unmatched reliability.

SIMPLE TO PLAY
Numbers on screen seen through labelled windows, and instruction flash during play.

Batter Up

Name: Batter Up
Manufacturer: Volley
Year: 1976
Type: Videogame

Monitor:

Orientation: Either
Type: Raster: Standard Resolution
CRT: Black and White with a Color Overlay

Number of Simultaneous Players: 2
Maximum number of Players: 2
Gameplay: Competitive
Control Panel Layout: Multiple Player
Sound: Amplified Mono (one channel)

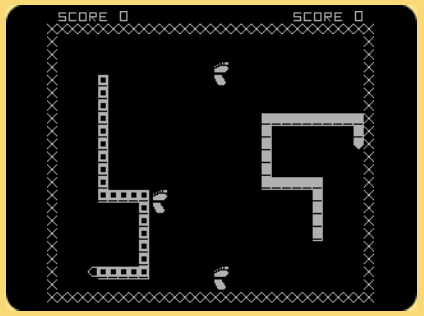
Bigfoot Bonkers

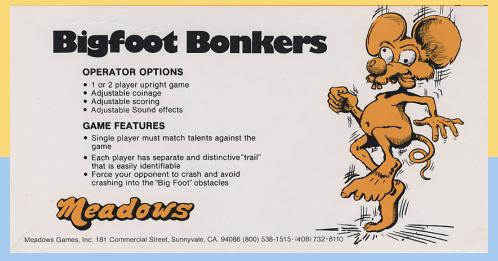
Manufacturer *Meadows*
Release *1976*
Class *Wide Release*
Genre *Racing*
Mode *4 Players*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Buttons: *Directional (up, down, left, right)*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Bigfoot Bonkers, a Blockade clone. is a variation on the 'surround your opponent' style of game. In this game, players take the role of mice in a small playfield with a few bigfoot feet that must be avoided in addition to the walls.

The game is 2-player only, and both players are in a survival match to see who can avoid crashing longest. As players move about the playfield, they leave a trail behind. Hitting any part of the trails, or the bigfoot feet, causes a player to lose that round and gives one point to their opponent. First one to six wins the game.

"mobygames.com"





BiPlane is a two-player competitive game, where each player controls a biplane and tries to shoot down their opponent. The player who shoots down their opponent the most within a fixed time period is the winner.

At the start of each game, each player's biplane (one white, one black) starts in one of the corners at the bottom of the screen, facing towards the center. They then need to take off before reaching a small dividing wall at the bottom of the screen. Once airborne, they can shoot small missiles at their opponents. These missiles will travel in a straight line, but only a fraction of the screen width before exploding, and only one per player can be fired at a time. If either player reaches the edge of the screen, then they will be hit by "anti-aircraft fire" which is displayed as a wall of small sparkling explosions. If a player is hit (either by crashing into the ground, wall, anti-aircraft fire or by an opponent's missile), then their opponent's score is incremented, and they are returned to their corner of the screen to try again. There is a warning that the game is about to end when the scores start to flash.

Control of the biplane is accomplished using two up/down levers. The first affects the plane's speed, while the second affects its pitch. One of the levers has a button on top, which may be used to fire at their opponent.

"mobygames.com"

BiPlane

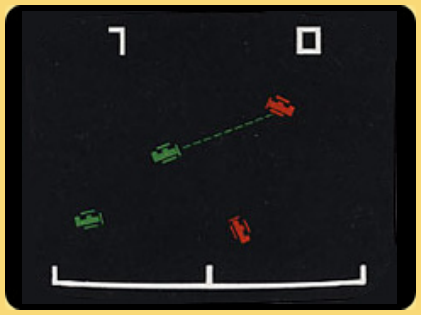
Manufacturer *Fun Games Inc.*
Release *1976*
Class *Wide Release*
Genre *Shooter*
Mode *2 Players*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Joystick: *2-way (up, down)*
Joystick: *2-way (up, down) with button*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (two channel)*
Cabinet Styles *Upright*

BiPlane 4

Manufacturer *Fun Games Inc.*
Release *1976*
Class *Wide Release*
Genre *Shooter*
Mode *4 Players*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Joystick: *2-way (up, down)*
Joystick: *2-way (up, down) with button*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (two channel)*
Cabinet Styles *Upright*

The game requires four players. The game screen has a long bar at the bottom with a divider in the middle. That is the takeoff runway. Running into the divider causes the plane to crash. Players must gain speed prior to takeoff then pull the up/down control back to take off. Once in the air a player can slow down if necessary. Anti-aircraft fire rings the outer edges of the screen. If players fly into it, they are shot down and crash. Each player's Biplane has it's own speaker. Once players make it into the air, the object of the game is simple; shoot each other out of the sky before time runs out. Score is kept at the top of the screen. When time is about ready to run out, the scores begin to flash until the end of the game. Each score is the same color as it's Biplane; either black or white. The game is kind of like an air-based version of Space Wars, but this game was released two years earlier and uses a raster monitor.

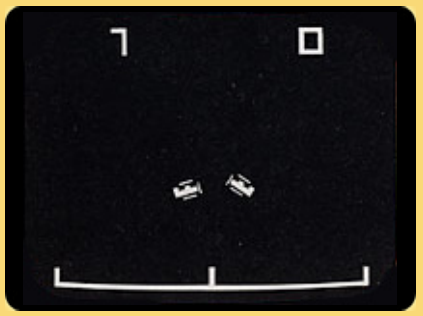
"arcade-museum.com"

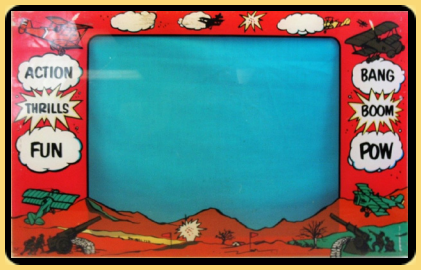


The cabinet is short upright with woodgrain sides and front. The monitor bezel has artwork with a WWI battle scene on the bottom showing cannons, men, air explosions, etc... On the left side of the monitor are the words 'Action', 'Thrills', 'Fun' and on the right side are the words 'Bang', 'Boom', 'Pow'. Both sets of words are inside either cloud shapes or explosion shapes. All over the bezel are pictures of Biplanes engaged in dogfights. The marquee bezel has the game name in the center with two Biplanes, one on each side. Most of the monitor bezel and marquee are in red. The marquee is originally lit with a long incandescent lightbulb called a 'Lumaline' bulb that glows very nicely, however a bit warm. The control panel has silkscreened graphics which demonstrate the controls function and game instructions.

This game uses a four-card, card-cage setup that operates without a CPU. The rack is powered by a +5VDC linear supply which can be easily substituted with one of today's switching power supplies. The +5 volt power supply had a massive heat problem. A fan would have helped here. The marquee Luminal bulb is expensive and very unreliable.
The game has switches for 25/50 cent play, 50/60 Hz power, individual volume controls for each speaker, five pots for setting the pitch and tone of sound effects, a pot for setting the white Bi-plane's shot distance to be the same as the black, and a pot to adjust the length of the game.

"arcade-museum.com"





Block Buster

Manufacturer *Mirco Games*
Release *1976*
Genre *Ball and Paddle*
Cabinet Styles *Cocktail*

Block Buster is a table-top ball and paddle game where the player attempts to eliminate all the blocks at the top of the screen.

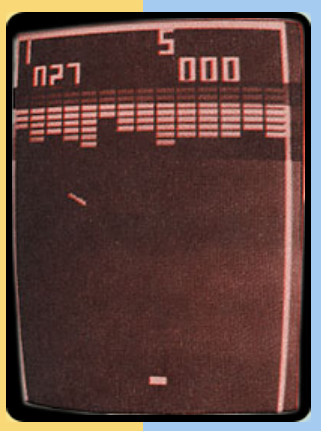
excerpt from the flyer:

DOUBLE COMPETITION — One or two players can compete for high scores.

During two player action, players compete against the machine for skill and against each other for high points.

EASY TO LEARN — With automatic, accelerating skill features.

CHALLENGING ACTION — Players score by eliminating the blocks in the wall. The blocks disappear as they are hit by the ball. The longer the volley, the more change of hitting the deeper rows of blocks to score more points. If all the blocks are eliminated, another wall quickly appears for continued action. Automatic ball speed increases and automatic reduction in paddle size add to the excitement and challenge.



Blockade

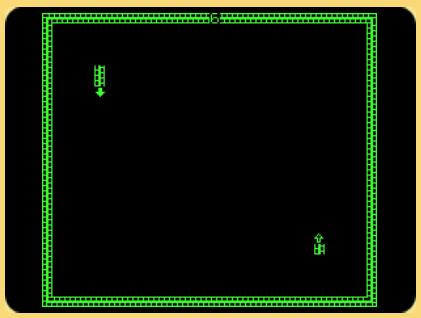
Manufacturer *UPL*
Release *1976*
Class *Wide Release*
Genre *Skill*
Mode *2 Players*
Gameplay *Competitive*
Panel Layout *Multiple Player Ambidextrous*
Controls
Buttons: *Directional (up, down, left, right)*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White with a Color Overlay*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

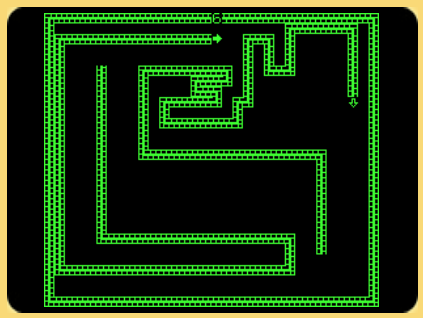
Blockade is the first of what would later become known as light cycle, or snake, games. It's a game for two players only, each who controls an arrow that leaves behind a trail of blocks that form a wall. The arrow moves automatically forward and by using four buttons the player is able to steer it by making ninety degree turns. The aim of the game is simply to stay alive longer than the opponent by not crashing into any of the walls. If a crash occurs the opponent will win the round and be awarded with one point. By default the player that first reaches six points wins the game but the value can be changed by the game operator.

"mobygames.com"

Several Blockade-style games appeared soon after its release, such as the Bally Astrocade game Checkmate in 1977, Atari's Surround in 1978, and the 1978 TRS-80 computer game Worm.

Though Blockade did not reference snakes or worms, many variants were themed as such, including Nibbler and Snake Byte, both from 1982. The 1997 Nokia mobile phone version is simply called Snake.





Blockade by Gremlin

excerpt from the flyer:

"The money magnet."

Put it on location, plug it in... and watch it pull in the coins! BLOCKADE™! The trailblazing smash hit of the MOA and Park Shows, fast becoming the "most imitated" new game of the year! Here's the great original... featuring Gremlin innovation, Gremlin engineering, Gremlin *quality.* BLOCKADE!

Designed for Player Appeal!

Ascreenthat'sALIVE!withbrightaction.Evenwhenit'snotbeing played, its advertising sequence COMMANDS attention! Irresistible SOUND!
Easy to learn, and CHALLENGING... no two games alike!

Designed for Low Maintenance!

Gremlin-clean electronic design and layout. Rugged Motorola monitor. Any major system component can be REMOVED IN LESS THAN 60 SECONDS!

Designed for Powerful Profits For You For Years!

Bombs Away

Manufacturer *Meadows*
Release *1976*
Class *Wide Release*
Genre *Shooter*
Mode *1 Player*
Gameplay *Single*
Panel Layout *Single Player*
Controls
Buttons: *1 [Bomb]*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White with a Color Overlay*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

excerpt from the flyer:

On target

An enemy fleet cruises directly below as you prepare for the final bomb run, finger waiting tensely on the bomb release. The aircraft carriers are hiding behind swiftly moving battleships and cruisers, a shield you must penetrate for the really big score. Suddenly a break appears and you move in for the carriers. Careful now. Punch the release button and... BOMBS AWAY! It's a direct hit and the carrier goes down fast

It's a direct hit

BOMBS AWAY is a direct hit with players bored by paddle and driving games. The astounding success of DROP ZONE 4, the forerunner of BOMBS AWAY, means this game is a proven profit-maker. Now you get this proven success with an ALL NEW cabinet, an ENHANCED attract mode and an IMPROVED screen display with brightly colored images of REAL battleships, cruisers and aircraft carriers. A direct hit sinks the ship right before your eyes.

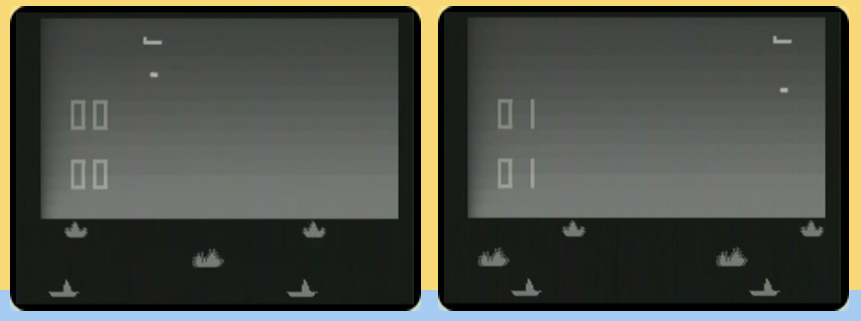
Potent payload

Each quarter loads the player's bomb bay with 15 HIGH EXPLOSIVE bombs, enough to win a replay at 40 points with practice. And inexperienced players who don't score even a single point (a feat in itself) are also awarded a free game so you'll get plenty of repeat business with BOMBS AWAY. Score and bombs dropped are displayed in big, clearly labelled numbers.

It stands out anywhere

Appealing air-sea combat graphic and flashing explosion display make BOMBS AWAY an attention-getter in any location.

Bombs away!

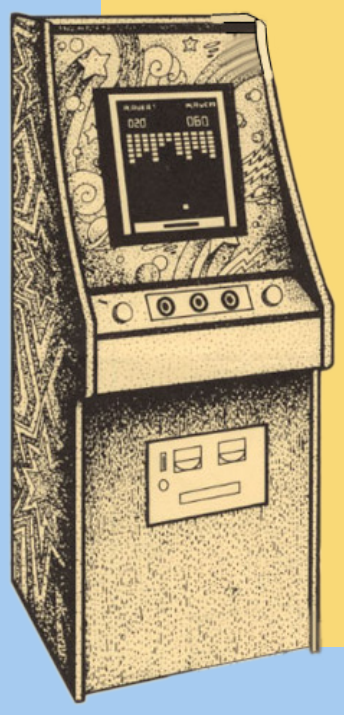


Break Away

Manufacturer	*Venture Line*
Release	*1976*
Genre	*Ball and Paddle*
Gameplay	*Alternating*
Cabinet Styles	*Upright* *Cocktail*

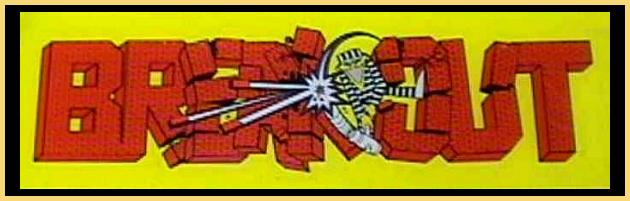
excerpt from the flyer:

- Break Thru the Wall of Bricks
- Each Two Rows of Bricks have a Different Scoring Value
- 1 or 2 Player
- Automatic Speedup feature
- Free Game or None. The Number of Serves, the Amount of Coins and Screen Mode are Adjustable.



ALL THE EXCITEMENT OF "BREAKOUT"

- Complete Kit of Conversions
- Use Your Old Monitors, Hardware and Cabinet Convert to New Games
- Drawings Furnished for Easy Conversion



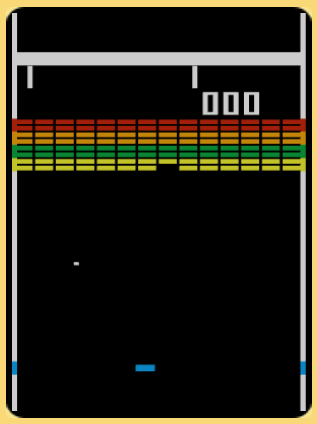
Breakout

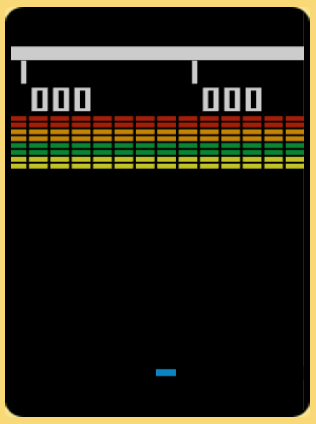
Manufacturer *Atari*
Release *1976*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *2 Players*
Gameplay *Alternating*
Panel Layout *Single Player*
Controls
Rotary: *Analog*
Buttons: *1 [Serve]*
Game Specific *Breakout Pinout*
Monitor
Orientation: *Vertical*
Type: Raster: *Standard Resolution*
CRT: *Black and White with a Color Overlay*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*
Cocktail
Mini

Breakout is an arcade game developed and published by Atari, Inc., released on May 13, 1976.

Breakout begins with eight rows of bricks, with each two rows a different color. The color order from the bottom up is yellow, green, orange and red. Using a single ball, the player must knock down as many bricks as possible by using the walls and/or the paddle below to ricochet the ball against the bricks and eliminate them. If the player's paddle misses the ball's rebound, he or she will lose a turn. The player has three turns to try to clear two screens of bricks. Yellow bricks earn one point each, green bricks earn three points, orange bricks earn five points and the top-level red bricks score seven points each. The paddle shrinks to one-half its size after the ball has broken through the red row and hit the upper wall. Ball speed increases at specific intervals: after four hits, after twelve hits, and after making contact with the orange and red rows.

The highest score achievable for one player is 896; this is done by eliminating two screens of bricks worth 448 points each. Once the second screen of bricks is destroyed, the ball in play harmlessly bounces off empty walls until the player relinquishes the game, as no additional screens are provided. However, a secret way to score beyond the 896 maximum is to play the game in two-player mode. If "Player One" completes the first screen on his or her third and last ball, then immediately and deliberately allows the ball to "drain", Player One's second screen is transferred to "Player Two" as a third screen, allowing Player Two to score a maximum of 1,344 points if he is adept enough to keep the third ball in play that long. Once the third screen is eliminated, the game is over.





Breakout, a discrete logic (non-microprocessor) game, was designed by Nolan Bushnell, Steve Wozniak, and Steve Bristow, all three of whom were involved with Atari and its Kee Games subsidiary. Bushnell wanted to turn Pong into a single player game, where the player would use a paddle to maintain a ball that depletes a wall of bricks. Bushnell was certain the game would be popular, and he and Bristow partnered to produce a concept. Al Alcorn was assigned as the Breakout project manager, and began development with Cyan Engineering in 1975. Bushnell assigned Steve Jobs to design a prototype. Jobs was offered $750, with an award for every TTL (transistor-transistor logic) chip fewer than 50. Jobs promised to complete a prototype within four days.

Bushnell offered the bonus because he disliked how new Atari games required 150 to 170 chips; he knew that Jobs' friend Steve Wozniak, an employee of Hewlett-Packard, had designed a version of Pong that used about 30 chips. Jobs had little specialized knowledge of circuit board design but knew Wozniak was capable of producing designs with a small number of chips. He convinced Wozniak to work with him, promising to split the fee evenly between them if Wozniak could minimize the number of chips. Wozniak had no sketches and instead interpreted the game from its description. To save parts, he had "tricky little designs" difficult to understand for most engineers. Near the end of development, Wozniak considered moving the high score to the screen's top, but Jobs claimed Bushnell wanted it at the bottom; Wozniak was unaware of any truth to his claims. The original deadline was met after Wozniak worked at Atari four nights straight, doing some additional designs while at his day job at Hewlett-Packard. This equated to a bonus of $5,000, which Jobs kept secret from Wozniak. Wozniak has stated he only received payment of $350; he be-

lieved for years that Atari had promised $700 for a design using fewer than 50 chips, and $1000 for fewer than 40, stating in 1984 “We only got 700 bucks for it.” Wozniak was the engineer, and Jobs was the breadboarder and tester. Wozniak’s original design used 42 chips; the final, working breadboard he and Jobs delivered to Atari used 44, but Wozniak said, “We were so tired we couldn’t cut it down.”

Atari was unable to use Wozniak’s design. By designing the board with as few chips as possible, he made the design difficult to manufacture; it was too compact and complicated to be feasible with Atari’s manufacturing methods. However, Wozniak claims Atari could not understand the design, and speculates “maybe some engineer there was trying to make some kind of modification to it.” Atari ended up designing their own version for production, which contained about 100 TTL chips. Wozniak found the gameplay to be the same as his original creation, and could not find any differences.

The arcade cabinet uses a black and white monitor. However, the monitor has strips of colored cellophane placed over it so that the bricks appear to be in color.

The original arcade version of Breakout has been officially ported to several systems, such as Video Pinball, the Atari 5200 (included in Super Breakout), and the Atari 2600.

Breakout directly influenced Wozniak’s design for the Apple II computer. He said, “A lot of features of the Apple II went in because I had designed Breakout for Atari. I had designed it in hardware. I wanted to write it in software now.” This included his design of color graphics circuitry, the addition of game paddle support and sound, and graphics commands in Integer BASIC, with which he wrote Little Brick Out, a software clone of his own hardware game.

Wozniak said in 1984: “Basically, all the game features were put in just so I could show off the game I was familiar with—Breakout—at the Homebrew Computer Club. It was the most satisfying day of my life [when] I demonstrated Breakout—totally written in BASIC. It seemed like a huge step to me. After designing hardware arcade games, I knew that being able to program them in BASIC was going to change the world.

excerpt from the flyer:

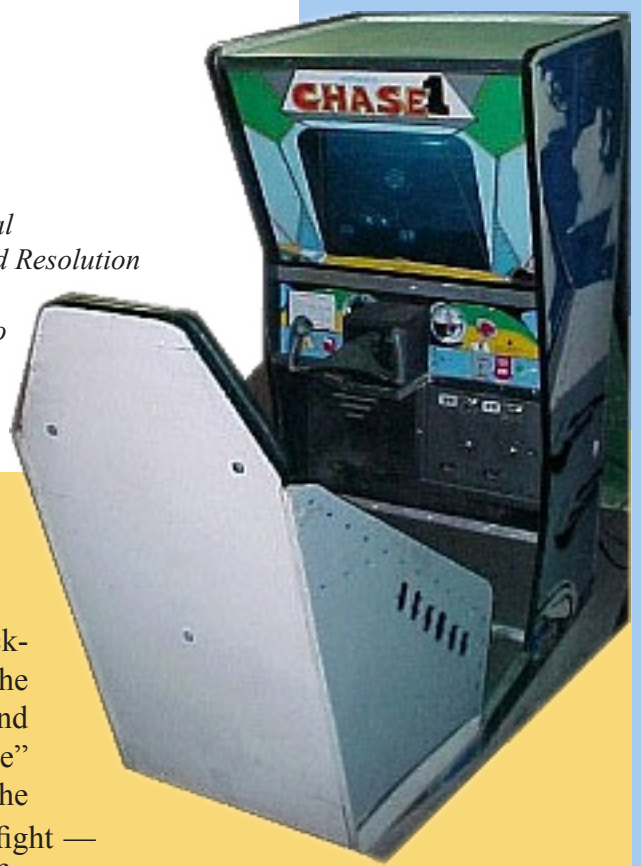
Bust out of the ordinary.
High profit potential is built in. Players can compete for points against an opponent or against themselves. High skill factor makes Breakout tough to master, invites replay for higher scores.
The Jailbreak Caper.
Breakout sets up with 8 rows of bricks, each two rows are different color. Players get 3 balls to try to knock down as many bricks as possible to try to knock down as many bricks as possible by ricochetting the ball against the wall off of a video sledge hammer.

1 point is scored for each brick knocked out in the yellow row, 3 for each in the green, 5 for each orange. 7 for each red.

To add to the challenge, the hammer decreases to 1/2 size after the red row is broken through. Ball speed increases after 4 hits, increases again after 12, to highest speed in the orange and red rows.
More options.
Breakout can be adjusted from 3 to 5 balls per game. If player knocks down all bricks, wall reappears for more chances to score.
Extended play can be awarded after operator-adjustable number of points total is achieved. Operator can adjust to any total in increments of 100.
Special Features.
Color overlays over the playfield, sound effects speakers located high in the cabinet and fluorescent graphic panels attract players anywhere. A protective hood and a 15” playfield screen tilt angle cuts down on distracting reflections and glare.
Atari standard features
include locking cashbox, hinged cash door and reliable Durastress-tested solid state electronics.
InstaPart™ Service.
24-hour parts turn-around is available to keep profits coming non-stop.
Dimensions.
Width: 25 1/4”; 64.1cm. Height: 65 1/2”; 166.4cm. Depth: 27 3/4”; 70.5cm.

Chase1

Manufacturer *Allied Leisure Industries*
Release *1976*
Class *Wide Release*
Genre *Shooter*
Mode *2 Players*
Gameplay *Alternating*
Panel Layout *Single Player*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Cockpit*



excerpt from the flyer:

CHASE

The authentic "Ace flier" cockpit puts you in the air and in the action. The solid state logic and sounds built into the "Chase" fighter gives the "flier" all the excitement of a swirling dogfight — one of the many important features built into all of Allied Leisure's specialty games.

HOW TO PLAY:

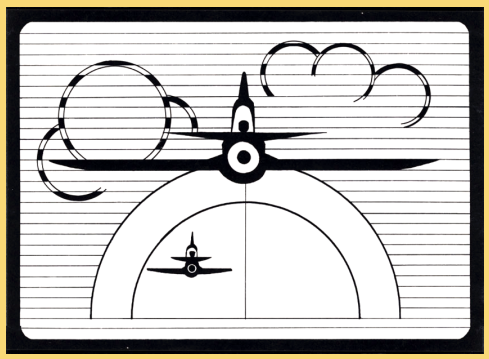
Insert coin, enemy aircraft will appear in formation of two.
Pursue enemy aircraft, manoeuvre them into cross hairs and fire.
When enemy aircraft are hit, they explode and player scores a point.
Playing is extended when score reaches 20.

SPECIFICATIONS:

Height:	59"
Width:	28"
Depth:	60"
Weight:	195 lb.
Power:	150W
Cabinet:	Solid Plywood Construction

SPECIAL FEATURES INCLUDE:

The memory Circuitry allows a variety in the movement of the enemy aircraft as the game progresses.
Enemy aircraft change direction.
Enemy aircraft increase and decrease in size.
Enemy aircraft bank steeply out of firing range.
Authentic sounds of jet aircraft in steep dives and high speed chase. Machine gun sounds as you fire and sound of explosions as the enemy aircraft are hit and dive to the ground. All sounds with separate volume controls.



Ckidzo

Manufacturer *Meadows*
Release *1976*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *4 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Joystick: *2-way (left, right)*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Cocktail*

excerpt from the flyer:

Sophisticated insanity

You don't have one yet, so you don't know what CKIDZO (Skid-zo) does to people. This new mind-bender from Meadows drives players into a paddle-action frenzy like no other game. Because they just can't quite get it under control, your customers keep playing and playing and playing.

Super-serviceability

CKIDZO'z no-nonsense cabinet is an operator's dream. a hinged coin door means fast access to the coin acceptor and table latch.

Clay Buster

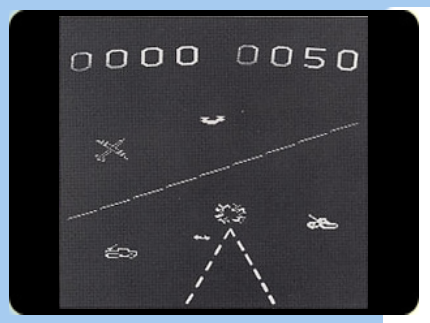
Manufacturer *Model Racing*
Release *1976*
Class *Wide Release*
Genre *Light-gun*
Mode *2 Players*
Gameplay *Alternating*
Panel Layout *Single Player*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White with a Color Overlay*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Clay Buster is a shooting game where the player uses a positional rifle to shoot on-screen clay pigeons.

excerpt from the flyer:

INSTRUCTION

After pressing button the display above the lake will "ready" and display the score the player achieves if he hits both clays. Shots per sequence are indicated below the word "fling". The highest score is indicated on the left and is replaced by the score on the right when a higher score is achieved by the player.



Cobra Gunship

Manufacturer *Meadows*
Release *1976*
Class *Wide Release*
Genre *Shooter*
Mode *2 Players*
Gameplay *Alternating*
Panel Layout *Single Player*
Controls
Joystick: *8-way with button*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

excerpt from the flyer:

Heavy Action

"Delta Leader to Delta Squadron. Delta Leader to Delta Squadron. Approaching target area. Turn to two-seven-oh degrees. Decend to flight level one. Delta Leader out."

"Delta Leader, this is Wing-Three. Surface target at five-niner degrees..."

"Delta Squadron, this is Delta Leader. Decend to five hundred feet. Looks like armored column heading north to Area Six. Approach and strafe."

"Delta Leader! Delta Leader! This is Wing-Two. Bogies at three o'clock high!"

"Ascend to one-zero thousand feet, Wing-Two and engage..."

Colorful Graphics

Cobra Gunship is the latest, hottest air-combat video game. Every detail of the cabinet, graphics and video display bespeaks of unbelievable realism. And, it's built to take the kind of beating a game like this is going to get.

Colorful explosion-display cabinet graphics attract players in *any* location. Realistic flight controls and instrument panel beckon those who dream of flying air combat.

Cops ‘N Robbers

Manufacturer *Atari*
Release *1976*
Class *Wide Release*
Genre *Shooter*
Mode *4 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Joystick: *8-way with button*
Pedals: *1*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White with a Color Overlay*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

In Cops n’ Robbers, 1 to 4 players play the parts of the police and criminals. The game always has either 2 or 4 players, and if there is an odd number of players, the computer controls the remaining players. Half the players control the cops, and the other half controls the robbers. The two sides are each on one side of the street in their car, shooting each other. Each side can move up and down their own lane. A beer truck moves up and down the center lane, which gets in the way of the shooters.

“mobygame.com”

excerpt from the Service Manual:

PHYSICAL DESCRIPTION OF GAME

Atari’s “Cops ‘N Robbers” is a car chase video action game for 1, 2, 3 or 4 players. The game is packaged in its own distinctively-styled upright cabinet a 23-inch black-and-white TV monitor is mounted with its picture tube facing a mirror. The players stand in front, looking at the TV picture reflected at them by the mirror. Four sets of player controls, one for each player, are provided on the front side of the cabinet. The leftmost set is for the leftmost car in the TV picture, and the rightmost set is for the rightmost car. Each set consists of a foot-operated gas pedal and a hand-operated pistol grip and trigger. Two backlighted start push buttons are also mounted on the front of the cabinet. Several strips of colored transparent material are affixed to the TV picture tube. During game operation these strips filter the white light emitted from the TV tube so that certain portions of the TV picture will appear highlighted in color.

Two identical coin mechanisms are mounted below the gun control levers, at the center of the cabinet’s front side. The coin mechanisms accept quarters only and are connected so that deposit of coins in either one can initiate game plays. The Cops ‘N Robbers game has an owner/operator option that allows selection at the game site of any of four choises for the cost per play sequence. The cash box is located behind a locked access door to the coin mechanisms. Two speakers are mounted inside the cabinet, one alongside each coin mechanism. During play the speakers produce a variety of sounds that add to the game excitement.

SUMMARY OF GAME PLAY

In Cops ‘N Robbers the players drive cars along parallel, double-lane roadways that appear on each side of the TV picture. The players see the cops, in either one or two cars, on the right. Each player controls one car and each car has a machine gun barrel that protrudes from the side facing the opponents. The objective in the game is to build up score points by shooting bullets into the opponent cars.

By pushing his or her gun control lever back and forth, a player can cause the gun barrel on that car to swing to any one of seven angular positions, all of which point in the direction of the opponents. By squeezing the trigger , located near the top of the gun control lever, a player causes bullets to be fired from the gun’s barrel. By stepping all the way down of the gas pedal a player causes that car to move upwards along the roadway, from the bottom of the picture toward the top. And by releasing the gas pedal a player causes that car to drop back toward the bottom of the picture.

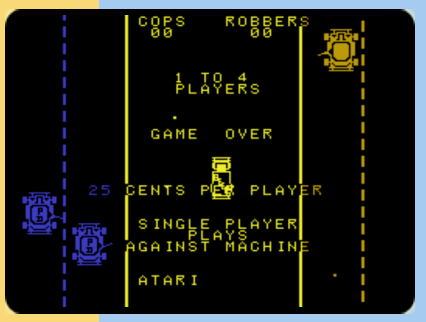
Besides the car and bullet movement just described, the player’s illusion of a car chase is further enhanced by having the dotted-line center divider strips along each roadway simultaneously move from top toward bottom in the picture, and by having one or more beer trucks independently move along the center of the picture, starting from the bottom and going on off the top.

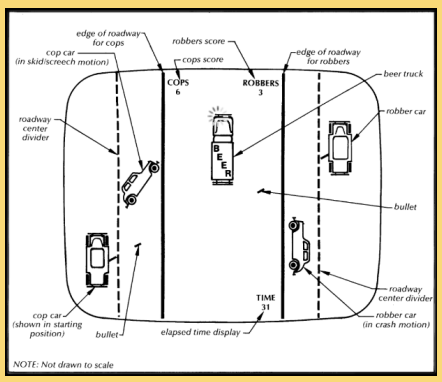
A bullet hitting a car causes that car to roll into a skid/screech motion followed by a crash motion, and finally to disappear off the bottom of the picture. One score point is awarded for each hit made on an opponent car. The accumulated cops score and robbers score are continuously displayed near the top of the picture. The are no restrictions on the total number of bullet fired, but generally the previous bullet must travel off the screen or hit an object before a new bullet can be fired.

After a car has been hit and disappeared from the TV picture, by stepping on the gas pedal that player can cause the car to reappear at some random position along the roadway. The car then resumes the game play.

A numerical display of remaining game time appears near the bottom of the picture throughout game play. The number displayed is periodically decremented by one count. When the display reaches zero it means that all the game time has elapsed and the play sequence then end. The Cops ‘N Robbers game feature an owner/operator option that allows selection at the game site of any one of four fixed game times.

The following sounds are produced by the speakers during play sequence. For the cop cars the left speaker produces a motor accelerating sound when a gas pedal is depressed all the way down. The right speaker produces corresponding motor sounds for the robber cars. Both speakers simultaneously produce these other game sounds: a gun-fire sound whenever a bullet is fired, a zing sound whenever a bullet ricochets, and a screech and crash sound whenever any car is hit by a bullet.





Crashing Race

Manufacturer *Taito*
Release *1976*
Class *Wide Release*
Genre *Racing*
Mode *2 Players*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Steering: *Wheel*
Shifter: *2-position (forward, reverse)*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White with a Color Overlay*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Crashing Race is a competitive car racing game where each player must try to crash as many computer-controlled cars as possible to score points. The player with the most points wins.

Death Race

Manufacturer *Exidy*
Release *1976*
Class *Wide Release*
Genre *Racing*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player Controls Differ*
Controls
Steering: *Wheel*
Pedals: *1*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White (25")*
Sound *Amplified Mono (two channel) one speaker for each player*
Cabinet Styles *Upright*

Released in April, 1976, Death Race is a modification of Exidy's 1975 game Destruction Derby in which players crashed into cars to accrue points. In Death Race, the objective became to run into "gremlins" to gain score.

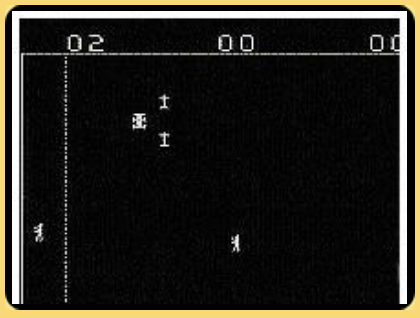
In 1975, Exidy licensed its game Destruction Derby to arcade game company Chicago Coin to manufacture. However, the following year Chicago Coin entered financial difficulties which would eventually lead to the dissolution of the company, and as Exidy had sold exclusive manufacturing rights they could not longer profit from Destruction Derby.

Needing an interim product to introduce to distributors, they decided to modify the Destruction Derby game so that it would be saleable by their organization. Newly arrived engineer Howell Ivy from Ramtek made several modifications to Destruction Derby in order to create this new product. He added curbs to the left and right of the screen that the enemies could hide behind, but players would be stalled if they attempted to cross over. On the top and bottom of the screen, players could wrap around to the opposite side in a manner similar to Atari's Space Race (1973).

The goal of the game was fairly simple, if somewhat gruesome – rather than trying to destroy each other's cars, the players would score points by running over fleeing stick figures called "gremlins". A score of 1-3 points earned the player the rank of Skeleton Chaser; 4-10 points Bone Cracker; 11-20 Gremlin Hunter; and for more than 20 points, a player was dubbed Expert Driver.

Adding to the game's morbid theme was its equally gruesome cabinet art, created by Pat "Sleepy" Peak. Among the images was a grim reaper standing before two open graves beckoning toward a pair of drivers. The sound effects also added a chilling touch - when the player hit a gremlin, it emitted a tiny electronic scream and was replaced by a cross. The gameplay bore a suspicious resemblance to the 1975 film DeathRace 2000, and most sources report that the game was directly inspired by the movie, though sources at Exidy (including designer Howell Ivy) insist this wasn't the case. Released in 1976, Death Race created a firestorm of controversy.

Paul Jacobs: *"Death Race did cause quite a stir, but not until an Associated Press reporter ran a story in Seattle. She had been in a shopping mall and noticed a line of kids extending out the door of the arcade in the mall. She was curious and went to see what was happening and found out they were all waiting in line to play Death Race. She watched them play and then she concluded that this was a horrible game that showed humans being run over by cars and said the sound when hit resembled a "shrieking child". Well, every paper in the country picked up the story and that started the controversy. The funny thing is that Death Race was just a "filler" game until our next attraction, Car Polo, was ready for production. It was a modification of Destruction Derby using cars versus skeletons rather than cars versus cars. It required very little development time. We had only released 200 but after the notoriety, we ended up making around 3000 (including PCB sales overseas). Articles about the game were in all major newspapers, plus Newsweek, Playboy, National Enquirer, National Observer. Midnight, the German magazine Stern, and many more. Na-*



ally syndicated columnist Bob Greene devoted a column to the game. I was interviewed and featured on the NBC television news magazine show "Weekend" with Lloyd Dobbins and then excerpts were shown the following week on the Today show and the Tonight show. The interview was then featured in a PBS television documentary called "Decades" as an important news event for the year 1977. I did live interviews for many U.S. radio stations and also both CBC (Canada) and BBC (England). It was a story that just wouldn't die, and Exidy laughed all the way to the bank."

The article by Wendy Walker:

Most find it humorous

New game: Chase Pedestrians

SEATTLE (AP) — The latest computerized game at the local bar or poolroom is called "Death Race." For 25 cents, you can pretend you're running down pedestrians with a car.

The game puts the player behind a steering wheel and accelerator pedal and lets him chase "gremlins" across an electronic playing board for 99 seconds.

The skeletal figures bear strong resemblances to people. When hit by a car, they emit a shrieking sound — something like the scream of a child — and turn into gravemarkers.

"If people get a kick out of running down pedestrians, you have to let them do it," said Paul Jacobs, director of marketing for Exidy, the Palo Alto, Calif., company that designed and distributes the game. "This is the sort of challenge that pricks the person's mind a little bit."

Jacobs said "Death Race" has been distributed nationwide but that it's a "trade secret" how many there are. He did say the game "happens to be out most popular game at the time. In fact, the business it attracts far outvalues any of the other games we've ever marketed."

The game scores point for each figure run down, and when it's over the player is rated on a scale ranging from a futile "skeleton chaser" to na accomplished "expert driver."

"The name 'Death Race' may shock a few people," Jacobs said, but; we find the game humorous."

He said it is an offshoot of an Exidy product called "Destruction Derby," in which players crashed cars into one another. "We decided to put a twist on the idea, so we added the graveyard effect and the shrieking sound."

Jacobs said the game offended som distributors who refused to contract for it.

Bill Aubbon, director of the Seattle Center arcade, said the game has been in the arcade for about two weeks,"and so far no one has complained."

When first contracted, Aubbon said he wasn't aware of the game, but "it sounds a little hard to imagine." Checking further, he said he was relieved to find out "those are gremlins that you run down. You're not supposed to think they're people."

Intended or not, "I suppose they do resemble human forms," Jacobs said. "I don't think people really get off on thinking they ran down a pedestrian. I think they just like to see how good a marksman they are."

Dr. Byrde Meeks, a Seattle psychologist who once worked with aggressive inmates at California's San Quentin Prison, disagrees.

"A game like that appeals to the morbidity in a person," she said. "That type of preoccupation with violence was common in the prisoners I dealt with. They would have loved the game... "Someone could argue that people act out their hostilities by playing games, but it has been proven time and time again that violence often comes from modelling."

If Exidy thought things would blow over after the AP story, they soon found otherwise as more articles began to appear in the following months. In response, Exidy further emphasized the fact that the game was a harmless diversion and that they'd been careful to avoid depicting actual pedestrians. "We have one of the best artists in the business." said GM Phil Brooks "If we wanted to have cars running over pedestrians we could have done it to curl your hair." As for the "scream" the game emitted when you ran over a gremlin - that was just a beep. "We could have had screeching of tires, moans, and screams for eight bucks extra. But we wouldn't build a game like that. We're human beings too."

An article from the 12/24/76 Times Picayune:

Council Runs Down 'Hit the Pedestrian' Game

CHICAGO (AP) — The National Safety Council says it is outraged by an electronic, coin-operated game which gives players a chance to run up points by running down figures of pedestrians.

The electronic driving game, "Death Race," is described in the winter issue of the council's Family Safety magazine, released Thursday.

Players operate a driving simulator, equipped with steering wheel an accelerator, to chase pedestrian figure across an electronic screen.

If a figure is hit, the machine issues a loud shriek and a cross-shaped grave marker pops up to score points.

The driver is rated as a "Skeleton Chaser," a "Bone Cracker," a "Gremlin Hunter," or for the top scorer, an "Expert Driver." It costs 25 cents to play.

"One of its most insidious and probably unrecognized characteristics is its shift from imaginary visual images of destruction, as you have in TV violence, to actual behavioral actions taken by the player," Fr. Gerald Driessen, behavorial scientist and manager of the council's research department, said in the article.

"The person is no longer just a spectator, but now an actor in the process of creating violence," he said.

Dennis Row, safety consultant for the Automobile Club of Southern California, said in 'the article: "We're trying to teach drivers how to take evasive maneuvers on the road, like avoiding pedestrians. "And here this morbid game comes along and encourages people to develop the opposite skill — how to hit people."

Paul Jacobs, marketing director for Exidy Inc., of Mountain View, Calif., manufactor of "Death Race," said in a telephone interview that the game "is humorous arcade piece requiring dexterity." "It is entirely harmless. There is no blatant violence like in some TV shows," he said. "We feel no remorse in producing the game and have thousands distributed — and a backlog of orders — since it came out eight months ago. There is nothing on the screen that depicts a street or highway."

The hysteria exhibited in some of the articles was almost comical. A Tucson Daily Citizen article was titled "If You've Got Time to Kill… Game Goal: Road Carnage". A photograph of a young girl playing the game bore the caption "Death race or death wish?" and asked if the game

was a harmless fad or "…will chasing down pedestrians on a TV screen now encourage her to cut pedestrians down on real highways later?" The article quotes one arcade manager, who compares the game to Gun Fight, a game whose violence he feels is harmless: "…but that's the tradition of the Great American West, having a shootout, a duel, in the street. But deliberately running people down - that isn't an American tradition at all." Another operator explained "When you leave a game room, you don't go out with a gun in your pocket and shoot your neighbour down. But you do go back to your car and start driving again."

Over the years, a number of rumours about the controversy caused by Death Race have appeared, among them: that a bomb threat was called into Exidy headquarters by someone upset with the game and that the game was banned outright in some countries resulting in some foreign operators serving jail time.

Paul Jacobs: *"I do not know of any country that banned the game (all markets that we sold to around the world accepted it), but I do believe that a Japanese distributor was briefly jailed for selling it. But I'm not so sure it was necessarily for selling the game itself or that he did not follow proper import procedures (pay appropriate import duties, etc.)"*

As it often the case, the controversy over the game only served to boost sales. As company founder Pete Kaufmann puts it "nobody wanted to buy it, but everybody kept ordering it". Programmer Ed Valleau recalls that after an initial run of about 1,000 units, Death Race had to be brought back into production twice and another 1,000 units were produced. Production had just wound down when the AP article hit and the ensuing brouhaha necessitated another run. Paul Jacobs recalls that about 2,000 uprights were built plus an additional 1,000 PCBs for sale overseas. While its sales were tame by Atari or Midway's standards, it did provide Exidy with its first real hit yet as well as a steady source of income. In 1975, total sales were about $250,000. In 1976, they increased to $3,000,000. In 1977, Exidy produced a sequel to the game called Super Death Chase, a modified version of the original designed by Arlen Grainger that featured skeletons in place of "gremlins". The game was shown at the 1977 AMOA show, but apparently never made it into full production and only a few units were built.

by: "allincolorforaquarter.blogspot.no"

"Deluxe Baseball, a new, truly realistic game by Ramtek"

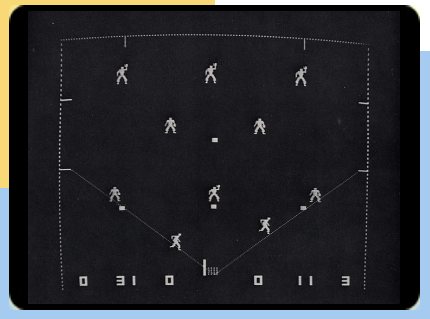
excerpt from the flyer:

CHECK THESE EXCITING AND PROFITABLE FEATURES:

- Can be played by 1 or 2 Players.
- Infield and outfield action, double plays.
- Strikeouts and walks possible.
- Outfielders can be repositioned.
- Realistic runners and fielders.
- Pitches can be fast or slow or curved.
- All solid state for low maintenance and long life.
- Commercial 23" TV monitor insures reliability.
- One year logic board warranty.
- Operator selectable features:
  Length of play
  25¢ or 50¢

Deluxe Baseball

Manufacturer *Ramtek*
Release *1976*
Class *Wide Release*
Genre *Sports*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Player Controls Differ
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*
Mini



Desert Fox

Manufacturer *Milwaukee Coin Industries (MCI)*
Release *1976*
Class *Wide Release*
Genre *Shooter*
Mode *2 Players*
Gameplay *Alternating*
Panel Layout *Single Player*
Controls
Joystick: *8-way with button [Fire]*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Desert Fox is a WWII air versus land battle game that is set in the desert. Players control a plane and fire with a machine gun at enemy tanks, trucks, weapons, carriers and personnel on the ground.

As players fly the Allied plane, they shoot at actual photographs of German Africa Corp tanks, soldiers and equipment. If players hit a picture it would register a hit. It is a timed game. PLayers have to accumulate a certain amount of points to continue.

"arcade-museum.com"

excerpt from the flyer:

Sales Features

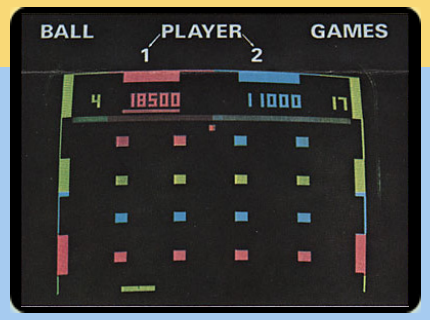
1. Exciting joystick response controls flight as player dives his plane at Rommel's Afrika Korps. The realistic World War II desert scenes are authentic replicas of the Panzer Division's tanksm trucks, weapons carriers and personnel.
2. Real machine gun action, complete with tracers. Player-pilot sees and hears his target explode. Sound effects include: variable pitch plane engine in combat, rapid-fire machine gun, exploding tanks and trucks.
3. Special bonus: Eight hits wins player 30 seconds additional flying time.

Flipper Ball

Manufacturer *Cinematronics*
Release *1976*
Class *Wide Release*
Genre *Video Pinball*
Mode *2 Players*
Gameplay *Alternating*
Panel Layout *Multiple Player*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White with a Color Overlay*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Cocktail*

Flipper Ball is a colorful video pinball game from Cinematronics. The game has an on-screen horizontally-controlled flipper which the player uses to knock out bumpers and hit a moving target to score points.

"arcade-museum.com"



excerpt from the flyer:

"A Long Drawing Game Designed with the Operator in Mind"

• 1 or 2 players.
• Solid Tempered Plate Glass Table Top.
• Hinged Top for quick cleaning and component removal. A serviceman's dream.
• Solid State Transistorized Integrated Computer unit.
• 26" high • 33" diameter table top
• weight 150 lbs.
• Factory Warranty: 1 year on major components.
• Pregame display to attract attention when not in use.
• Full color play on 19" black and white monitor unit.
• Unique Sound - Real chimes plus realistic pinball electronic sound effects.
• Adjustment. 25¢ play - 2 plays for 25¢ or 3 plays for 50¢. Free ball or free game. 3 or 5 ball play.
• 16 bumpers - 9 pockets plus moving target. Bonus scoring for moving target and knocking out all bumpers.
• Horizontally controlled flipper. Ball rebounds left, right and straight up.

Flyball

Manufacturer *Atari*
Release *1976*
Genre *Sports*
Mode *2 Players*
Monitor
Orientation: *Horizontal*
Controls
Controls: *stick*
Buttons: *1*
Cabinet Styles *Upright*

Flyball is a baseball game by Atari. Each player controls either the pitching team or the hitting team. Both pitching and batting are controlled via joystick. The pitching team has only one player on the field at a time (the pitcher), while the hitting team can have up to four, depending on what bases they're on. As in real baseball, the goal is to hit the ball and run the bases, and the team with the highest score after the innings run out wins. The game lasts one or two innings, depending on how the owner sets the machine up.

"mobygames.com"

Fly Ball came in an upright cabinet that was neon green and white, with sideart of baseball players in action. The marquee matched the cabinets sideart almost exactly, and used the same color scheme. The game used an unadorned white monitor bezel, which was rather unusual as most games either have black ones, or decorated ones. The control panel featured two smallish analog joysticks, and a single action button for each player. This game uses a 23" black and white television as a monitor.

Dave Shepperd: *"Neither Rich* (Rich Patak) *nor I knew anything about baseball when we were assigned to do this game. I remember Rich and I looking at each other quizzically each wondering if what was going on on*

the screen was right and hoping the other would speak up if not. Ahhh.. the old days. the screen was right and hoping the other would speak up if not. Ahhh.. the old days. The blind leading the blind..
There is a serious bug in this game. I didn't realize this was not the rule in baseball at the time, but in this game all base runners will advance on a walk even if there are empty bases between them. I heard second hand from marketing a number of years after production of this game ended that some location (most likely a bar) was extensively damaged as a result of a fight breaking out over this game. I never got additional details, but it's fun to speculate that there was some wagering involved and, due to this bug, a runner at third was incorrectly walked home..."

"arcade-history.com"

excerpt from the flyer:

Batter Up!
Designed for top 2-player attraction in any location. Flyball's animation and game play are so realistic it's like playing the real thing.

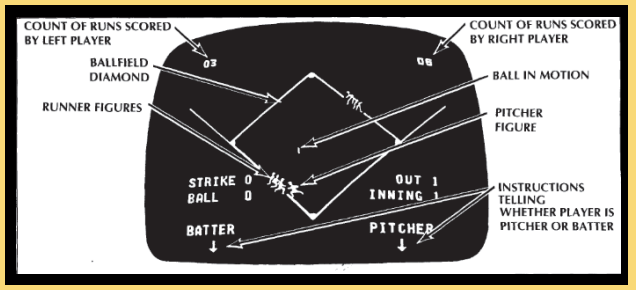
Take 2 and hit to the right!
Attention-getting attraction mode invites the player with an animated ballplayer running the bases. Flashing instructions on the 23" monitor explain the game.
The game starts with flashing signs pointing to the pitcher and batter, each player set to control his man, the crowd cheers and the first ball is pitched. Continuous joystick control moves the pitcher's arm realistically. The batter swings. It's a hit! The ball goes into the playfield... the crowd screams louder... the batter runs the bases. The pitcher directs his man to run up, down, left or right, chasing the ball. When he catches it, he has to tag the base runner before he reaches the base to put him out (allowing 3 or 4 seconds of action play). If he misses the ball, it's a round-tripper and the words "Home Run" flash on the screen!
Players are not required to switch positions when teams change sides after 3 outs. Flashing signs tell each player who is pitching and who is batting. Innings and scoring appear on the monitor.
Flyball can be played and enjoyed by all ages, all skill levels.

Repeat play increases the action and player abillity - faster pitches, in-flight curve for harder hits, and hit placement to any field. Players can use real-life tactics for bunts, stolen bases, faking the runner off base... You name it!!

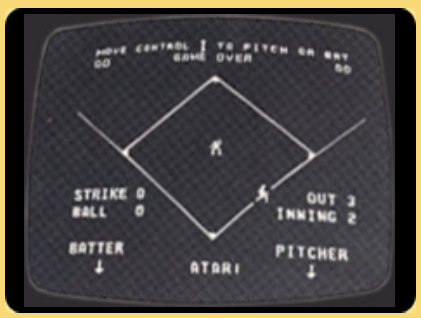
You flash the signs...
and manage the profits. Flyball is operator adjustable for 1 or 2 inning game time. And for 25¢ per game, or 50¢ per game.
New service features include a built-in diagnostic system for field adjustment of settings from front of cabinet without the need for external equipment. Static electricity is also greatly diminished through more advanced engineering techniques.

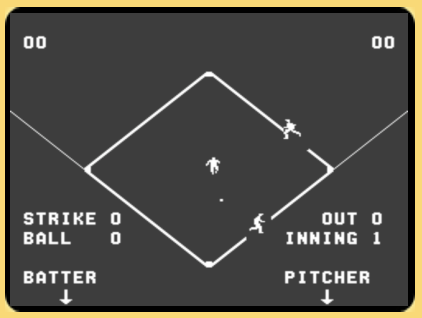
All Star Lineup
Atari standard features include large 23" monitor, bright side panel and attraction panel graphics, locking cashbox, hinged cash door and Durastress™ tested solid state reliable electronics.

Relief in the 9th
Instapart™ 24-hour parts turn-around is available to keep your profits scoring home runs, time after time.



Dimensions
Height: 63.62" or 261.6cm
Width: 25.25" or 64.1cm
Depth: 29.37" or 74.6cm





Fonz: The Game is a 1976 arcade racing game developed by Sega and published by Sega-Gremlin. The game was based on the hit TV show Happy Days and the slogan was "TV's hottest name, Your hottest game." The game itself was simply a rebranded variant of Sega's earlier 1976 game Moto-Cross, also known as Man T.T. (released August 1976), in a customized arcade cabinet. In turn, Moto-Cross and Man T.T. were motorbike variants of Road Race, a car driving game released in February 1976. Sega was allowed to rebrand their game as Fonz because its American branch at the time was owned by Charles Bluhdorn's Gulf+Western Company and thus had access to Paramount Television's intellectual property.

The general premise was the player controlled the Fonz on a motorcycle with handlebars on the cabinet. The player has to go as fast as possible without skidding off the road or colliding with other racing bikes on the screen. Turn the handlebars, and the bike would corner and bank. Twist the handle throttle open, and it would accelerate. When a collision with another bike occurs, the handlebars vibrate and the screen flashes a reverse image. To increase the challenge, the size of the bike can be regulated by the operator.

Game time is adjustable from 45 to 100 seconds.

Fonz

Manufacturer	*Sega/Gremlin*
Release	*1976*
Class	*Wide Release*
Genre	*Racing*
Mode	*1 Player*
Gameplay	*Single*
Panel Layout	*Single Player*
Controls	
	Motorcycle Controls: *Throttle, Brake*
Sound	*Amplified Mono (one channel)*
Cabinet Styles	*Upright*

excerpt from the flyer:

TV'S HOTTEST NAME.
YOUR HOTTEST GAME.

TV has made FONZ one of the best know names in America today. Now SEGA has made it possible for those 42 million FONZ fans to spend a quarter and literally become their motorcycle hero in an action-packed race.

Ride with FONZ and you'll know why the game will be your hottest attraction. Because the player experiences all the sensations and competition. Even the sounds are authentic.

The object is to maintain as high a speed as possible without hitting the other racing bikes on the screen or skidding off the edge of the road. Turn the handlebars, and you corner and bank with startling realism. Twist the hand throttle open, and you accelerate along with the rising scream of your high compression engine. Collide with another bike — the handlebars vibrate and the TV screen flashes a reverse image.

Scoring with FONZ is beautifully simple: 10 points per second at the slowest speed; 10 points every half-second at top speed. A crack-up costs 3 seconds of no-score. If the total score goes above 1000 kilometres, the extended play lamp goes on — and so does the player.

To increase the challenge, the size of the bikers can be regulated by the operator. Game time is adjustable from 45 to 100 seconds.

What about reliability? You'll rarely have to futz with FONZ. It's made in America by SEGA, the people who design games that can take it as well as dish it out.

Ask your SEGA Distributors about FONZ. You'll love the answers.

• Realistic imagery. Both road and bikes are seen in true perspective so that objects nearest the bottom of the screen (closest to player) are larger than those on the horizon or top of the screen.

• Handlebars function identically to those of a real motorcycle.

• Full range speakers produces all racing sounds with realistic impact.

• SEGA-built solid state electronics assure maximum reliability and ease of servicing.

Heavy Traffic

Manufacturer *Digital Games Incorporated*
Release *1976*
Genre *Racing*
Mode *1 Player*
Gameplay *Single*
Panel Layout *Single Player*
Monitor
Orientation: *Vertical*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Heavy Traffic is a vertical motorcycle racing game from Digital Games.

excerpt from the flyer:

1 or 2 PLAYER-
REALISTIC Sound-
Authentic Motorcycle Control

New Features Include

- Pro/AM Switch
- Lighted Credit Switch
- .25/.50 Cent Play
- $500.00 Locking Coin Vault
- One Piece Logic Board
- Full Factory Warranty
- 23” Solid State Monitor
- One year warranty on logic board and monitor

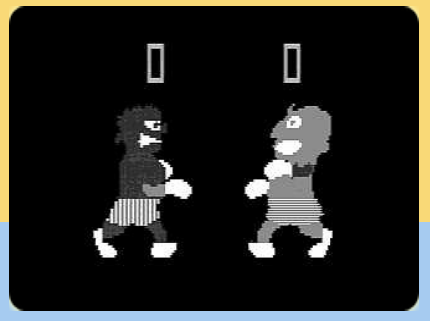
Heavyweight Champ

Manufacturer *Sega*
Release *1976*
Genre *Sports*
Mode *2 Player simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Heavyweight Champ is the first in a series of boxing games released by Sega. The 1976 game featured black-and-white graphics and critics have since identified it as the first video game to feature hand-to-hand fighting. It feature unique controls that simulate throwing actual punches.

It featured gameplay viewed from a side-view perspective. It employed two boxing glove controllers, one for each player, which moved up and down for high and low punches, with an inward movement for striking. It used large monochrome sprite visuals for the graphics.

Sega would later reuse the Heavyweight Champ name for both the 8-bit versions of James Buster Douglas Knockout Boxing released outside of North America.



Hit Me

Hit Me is a one- to four-player card game where each player is matched against the dealer.

Initially, each player is given a number of chips ranging from 5 to 40 and allocated a number of hands also ranging from 5 to 40. The card game played is 21 in which the object is to come as close to a total point count of 21 without exceeding it.

Manufacturer *Ramtek*
Release *1976*
Class *Wide Release*
Genre *Card*
Mode *4 Players Simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright Cocktail*

excerpt from the Operator's Manual:

INTRODUCTION

Hit Me is another Ramtek Amusement Device which is engineered to provide the highest degree of reliability using the most advanced techniques available. All solid state circuitry insures years of dependable service.

Hit Me is a one to four player game in which each player is matched against a dealer. Initially each player is given a number of chips ranging from 5-40. The card game played is 21 in which the object is to come as close to a total point count of 21 without exceeding it

GAME OPERATION

Initially each player drops a coin into the coin drop slot. For each coin dropped a player is entitled to a number of chips and hands ranging from 5 to 40 in steps of 5 depending of the settings of switches located on the game processor board. The games are set at the factory initiating with 40 chips and 5 hands. The first coin dropped results in a coin sound and a display on the upper right hand TV screen as follows:

	CHIPS	HANDS
#1		

The second coin dropped would add #2 underneath the #1 message. If four coins are dropped, the game automatically begins. If less than 4 coins are dropped, the start button must be pushed to start a game. Once the game has started, the number of chips and hands available for each player appears. For instance, in the four player case the display would be:

	CHIPS	HANDS
#1	40	5
#2	40	5
#3	40	5
#4	40	5

During the course of the game, the cards are not reshuffeled untill all 52 cards have been played.

excerpt from an article:

Cocktails for Four

Ramtek Corp. is unveiling a unique new cocktail table design for its blackjack video game, Hit Me. In Hit Me, one to four players can compete with each other or against the house. A game consists of a maximum of five hands or until the players lose their assigned 40 chips.

The new four-player cocktail table is upright in design so that nothing -- drinks, napkins, etc. -- can obscure the screen. And the unit, as opposed to the conventional cocktail table, can be placed against the wall.

The table top is 30" from the floor. Like the full-scale version of the game, the cocktail table Hit Me is equipped with a microprocessor.

Indy 4

Manufacturer *Atari*
Release *1976*
Class *Wide Release*
Genre *Racing*
Mode *4 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Steering: *Wheel*
Buttons: *1 [Horn]*
Pedals: *2*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Color*
Sound *Amplified Mono (two channel)*
Cabinet Styles *Upright*

Indy 4 is a 4 player arcade game by Atari, originally released in 1976. It was preceded by its larger 8 player counterpart, Indy 800, in 1975.

Gameplay is a simulation of an Indianapolis 500 style of race, in which players compete by racing each other with simulated IndyCar race cars. The player cars' colors are light blue, green, red, and dark blue.

The game is housed in a large custom square cabinet with two steering wheels and four pedals on each side. The monitor sits in the top of the cabinet. The game uses a 25-inch full-color RGB display and does not use color overlays.

The cabinet also features overhead mirrors to allow spectators to watch the game while it's being played.

This game has a truly massive game board. It is a card rack system containing a board for each of the four cars, sync, coin control and score boards.

excerpt from the flyer:

Now it's a four car race with Indy 4. Up to four drivers in four different colored cars can compete on a fast new track. Indy 4 is part of the same successful racing team as Indy 800. It's smaller, more compact and just as fast when it comes to high earnings. Atari makes you a profit winner in every race.

Large 25" colored monitor, attention-getting, protective smoked-plex canopy and 4 different colored cars add up to high visibility, attraction, and excitement.

A special design feature includes molded-in pockets in the control panel to hold glasses. Keep spills away from scratch-resistant plex video screen cover.

Compact Size. Indy 4 is designed to fit into more versatile locations. You can put Indy 4 against the wall, or turn smaller areas of unused island floor footage into space earns.

All metal food pedals. Rugged accelerator and brake pedals last longer, won't lose contact.

Locking cashboxes for tight security in busy locations, dual coin mechs and hinged cash doors complete Indy 4's standard features.

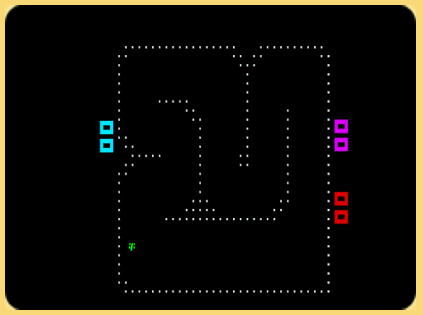
Player-attracting sound effects. As always, Indy 4 primes the excitement with 4 realistic sound circuits — the deep roar of accelerating engines and screeching tires are irresistible.

Built to drive the distance. Durastress™ tested, burned in circuity, and reliable solid state electronics keep Indy 4 always in the race, you profits non-stop.

Steel-frame construction makes Indy 4 a durable competitor.

Removable side panels for easy access to components and exclusive Instapart™ parts backup keeps pit service fast and easy.

Special option. Indy 4 can be ordered with an optional Rowe dollar bill acceptor. Easier collections for you, more convenience for drivers.



excerpt from the Operation manual:

INTRODUCTION

The Atari Indy 4 game consists of a cabinet, TV monitor, printed circuit boards (PCBs), interconnecting wiring, and various cabinet-mounted circuit components.

TV circuit malfunction can be solved using standard television troubleshooting techniques. However, the PCB computer requires troubleshooting techniques that may be unfamiliar to the average technician.

Before turning this machine on, inspect it carefully for any damage which may have occurred during shipment. Inspect both interior and exterior or the machine for any obvious damage to the cabinet or internal components. Check for cracked or disconnected wires, or foreign objects shorting electrical connections.

Interceptor

Manufacturer *Taito*
Release *1976*
Class *Wide Release*
Genre *Simulator*
Mode *2 Players*
Gameplay *Alternating*
Panel Layout *Single Player*
Controls
Joystick: *8-way stick with trigger*
Hardware *Taito Discrete Logic*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White with a Color Overlay*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Interceptor was made by Tomohiro Nishikado, creator of the arcade games Western Gun and Space Invaders. It was released in Japan in 1975 and abroad in 1976.

It is an early Combat flight simulator that involved piloting a jet fighter, using an eight-way joystick to aim with a crosshair and shoot at enemy aircraft that move in formations of two, can scale in size depending on their distance to the player, and can move out of the player's firing range.

excerpt from the flyer:

Features:

The Memory Circuitry allows a variety in the movement of the enemy aircraft as the game progresses.

Enemy aircraft change direction.
Enemy aircraft increase and decrease in size.
Enemy aircraft bank steeply out of firing range.

Authentic sounds of jet aircraft in steep dives and high speed chase. Machine gun sounds as you fire and sound of explosions as the enemy aircraft are hit. All sounds with separate volume controls.

HOW TO PLAY

• Insert coin, enemy aircraft will appear in formations of two.
• Purse enemy aircraft, manoeuvre them into cross hairs and fire.
• When enemy aircraft are hit, they explode and player scores a point.
• Playing is extended when score reaches 20, 44, 60 and 80 points. The game is over in 90 seconds if the score does not reach 20 points.

SPECIFICATIONS:

Height:	164.5cm (65")
Width:	63cm (25")
Depth:	80cm (32")
Weight:	85kg (188lbs)
Power:	150W
Cabinet:	Laminated Melamine Board

King / Kong

Manufacturer *Fun Games Inc.*
Release *1976*
Genre *Platform*
Mode *2 Players*
Gameplay *Alternating*
Panel Layout *Single Player*
Controls
Joystick: *2-way (up, down)*
Joystick: *2-way (up, down) with button [Fire]*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (two channel)*
Cabinet Styles *Upright*

In King players their biplane around the Empire State Building and shoot at King Kong (with Fay Wray in his clutches). They must avoid being swatted out of the sky by the giant ape.

The game is also known as Kong. The Kong release are said to be a prototype.

The game is based on the 1933 movie King Kong. It was released to coincide with the 1970's re-make of the classic film.

"A STAR IS BORN. AGAIN."

excerpt from the flyer:

What's big an hairy and doesn't cost $22 million? (Hint: It's **not** King Kong.) It's **KING:** the newest star of Fun Games' video line-up, and the flashiest, most profit-capable video game to come on the market in years. The ape is a mechanical marvel: King and his date are fully animated on a big 23" screen, and even when he's not in actual play — fighting the bi-planes shooting at his head and chest — the star is still on the move, with realistic gestures and growls. And players will be constantly challenged: degree of difficulty increases as King "reads" the play's degree of skill.

KING. A great Christmas present for your operation, at a great price. Call your distributor today, and get the king of video games working for you through the holiday season, and all year.

Knights In Armor

Knights in Armor is a fighting game where two knights challenge each other in a jousting contest. Players choose either The Black Knight or The White Knight and battle each other in a series of eight, ten or twelve jousts.

excerpt from the flyer:

- Laminated all Plywood Cabinet
- Screen displays "STUCK COIN" if coin gets stuck
- Double size characters
- Digital scoring
- Operator adjustable length of game — 8, 10 or 12 jousts
- Dimensions: length, 4' — depth, 2' — width, 25 3/8"
- Audio effects — Clopping of horses, smashing of steel
- Visual effects — Horses & Knights galloping towards each otherm Knights getting skewerd and carried off screen on end of lance, Knights getting dragged off screen by horse.
- Comes with 6 sets of instructions which mount inder bezel

Manufacturer *Project Support Engineering*
Release *1976*
Class *Wide Release*
Genre *Fighting*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Players must move through the maze and destroy all enemy tanks. If the players tank are destroyed, they must move a little flashing spot through the maze to another of their tanks. This may prove very frustrating as players can only see the flashing spot when it is against a wall. This may have been on the original board or a bad ROM version. To switch tanks on purpose (before the current one is destroyed), players must hold the "Change tank" button then move their joystick. Then they can release the button and go to another tank.

The right and left sides of the cabinet have a squared-off rectangular shape. They are solid yellow and contain a round decal. The front is yellow with no marquee and just a little art right around the border of the monitor.

"arcade-museum.com"

Lazer Command

Manufacturer *Meadows Games*
Release *1976*
Class *Wide Release*
Genre *Labyrinth/Maze*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Joystick: *4-way (up, down, left, right)*
Buttons: *2 [FireChange Tanks]*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White with a Color Overlay*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*
Mini

Meadows

LAZER COMMAND

excerpt from the maual:

INTRODUCTION

LAZER COMMAND, a game of skill and strategy, is a game that depicts a futuristic battle between two groups of nuclear powered later tanks. The object of the game is to blow up all 15 enemy tanks while trying to evade being hit by opponent's shooting lazers. The two opposing tanks are separated by either a simple "NOVICE" maze or a complex "EXPERT" maze. Only one of each player's tank can move or shoot its lazer at a time, and this tank must be occupied by its respective driver. "For strategic purposes" the driver can be moved at anytime from tank to tank.

DRIVERS EJECT BUTTON: Momentarily pressing EJECT BUTTON while actuating the control handle ejects the driver out of his tank. NOTE: It is not necessary to keep the EJECT BUTTON constantly depressed - only long enough to get driver out of tank he is presently in. To enter another tank, after ejecting of after being blown up, a driver simply moves into another of his own tanks by moving the control handle. The driver from one side will not operate tanks of the opposing player.

DISPLAY MONITOR: The upper left hand corner shows the time remaining during or at the end of game, and the upper middle section indicates coin credits. The lower left and right corners depict the number of enemy tanks "blown up" by the respective left and right player. The central area of the display shows the maze battlefield. The game ends when either all tanks of one player are blown up or if the time clock has run out. When the game has ended the word WINNER will be displayed on the side having blown up the largest number of enemy tanks. In the case of a tie, the word DRAW will appear in the center of the screen.

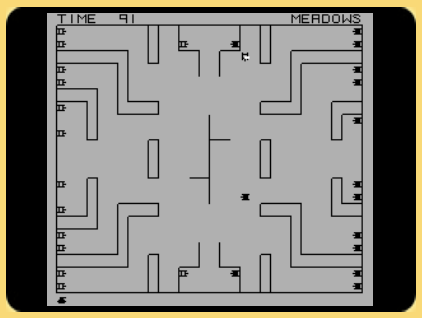
excerpt from the flyer:

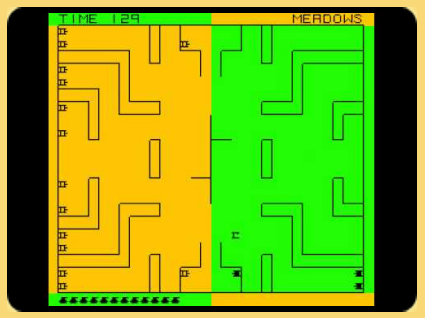
STANDARD FEATURES — OPTIONS

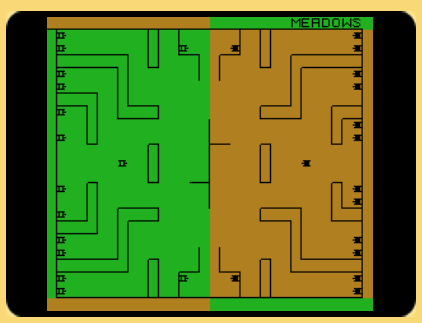
A 23" monitor, locking cash box, and dual coin mechanism to prevent down time are all standard. The settings for operator adjustable time and coinage are easily set through the use of a unique switch located on the P.C.B. Another features is the player option of choosing a more difficult field to manoeuvre through and keep player interest alive.

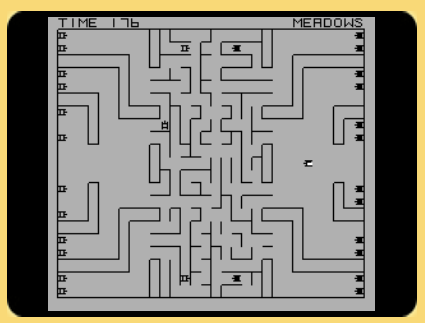
STURDY CONSTRUCTION — EASY ACCESS

The location tested throttle joystick controls are all new, Meadows designed for long life, and are virtually break-proof. The T.V. monitor is shock mounted using rubber grommets to safeguard against rough handling. The cabinet design incorporates a plywood front door for strength and it swings away to expose the T.V. monitor, coin box, coin mechs and P.C.B.'s for simple one sport access. The back door opens up to expose the unique flashing explosion lights which are easily changed, if required. A plywood cabinet base adds to the sturdy construction and long life of this great new game from Meadows.









LIGHTS — COLOR — ACTION

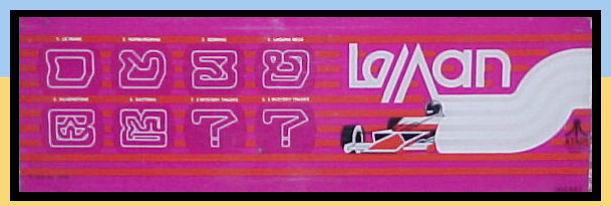
Color monitor overlay, explosive lights and fluorescent battlefield reflect off a bright mirror backglass to create the feeling of "being there". With the lazer fuel pack loaded the players manoeuvre through a preselected maze to eliminate the enemy. Players can use strategy and move "fuel pack" to another tank to fight off an approaching enemy and protect his lines. Knocking out your opponents tanks "notches" the score and, with players trying to out-duel each other, the action gets frenzied as time races by.

FUTURISTIC SOUNDS — EXCITING GRAPHICS

The "never before heard" sound effects attract attention to the game when not in play, and add to the intense action during manoeuvring for position. The multi-colored graphics have a hypnotic effect in attracting players to the game, and are eye appealing to any location.

FORGET ADJUSTMENTS

The monitor adjustments are set at the factory and should require no further turning — no control adjustment — no meters — no tools — just plug it in and it's ready ot play — no time consuming adjustments are necessary because we at Meadows are always thinking of you, the operators.



LeMans, a single-player race game, is the successor to the Gran Trak 10 and Gran Track 20 video games.

LeMans is a single-player racing video game in which the player drives along a race track shown in top-down view. The player controls the car using a steering wheel, accelerator and brake peddles and a four-position gear stick. The objective is to drive against a time limit around a series of race tracks, while avoiding oil slicks and the walls. There are six tracks based on real world race tracks (Le Mans, Nürburgring, Sebring, Laguna Seca, Silverstone and Daytona) and four "mystery tracks", two of which will be chosen at random if the player manages to complete the first six tracks within the time limit.

The game PCB is interchangeable with Atari's Gran Trak 10 game. The only difference between the two is the gear stick. Gran Trak 10 has a 3-speed with reverse while LeMans has a 4-speed.

excerpt from the flyer:

The green flag is up. Again!
New Le Mans™ continues the winning racing and profit tradition of Team Atari. Like its famouse forebears, Grank Trak™, Indy 8™, and Indy 4™ (the most profitable video games in the industry), Le Mans offers an all-new racing experience.

Ten tracks instead of one!
Le Mans challenges player speed and skill with 10 different tracks. Players race against the clock on each track as it appears in sequence. After the car passes the finish line of one track, a new one appears automatically, more difficult than the one before. The first track is a snap. The second, a little more difficult. The third...

The more skilled the driver, the more tracks will be completed within the game's time limit. And oil slicks don't make it any easier. 10 points are scored for each completed track.

Four mystery tracks
If a player finishes the first 6 tracks (shown graphically on the attraction panel), two of four possible mystery courses will appear randomly to add further excitement and challenge. (We may give away the world if a player can drive all 8 within the time limit).

Extended Play — special profit bonus
Extended play can be awarded after scores of 46, 50, 56, 60, 66, 70, and 76, which are pre-selectable by the operator.

An "Extended Play" sign lights up on the attraction panel when operator-selected score is achieved. Start button flashes and video playfield inverts — figures change from white on black to black on white.

Extended play begins with track 5 — makes the extra chance more challenging, more of an incentive for repeat play.

High performance goodies.
A 10" steering wheel, smooth-as-silk, 4 speed H-shift, durable all-metal brake and gas pedals add to the sensational realism.

Dimensions.
Height: 66", 16.764 cm; Width: 25.25", 64.135cm; Depth: 33", 83.82 cm.

LeMans

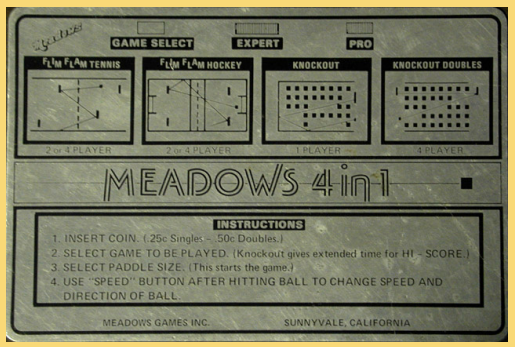
Manufacturer *Atari*
Release *1976*
Class *Wide Release*
Genre *Racing*
Mode *1 Player*
Gameplay *Single*
Panel Layout *Single Player*
Controls
Steering: *Wheel*
Shifter: *4-position (1/2/3/4)*
Pedals: *2*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

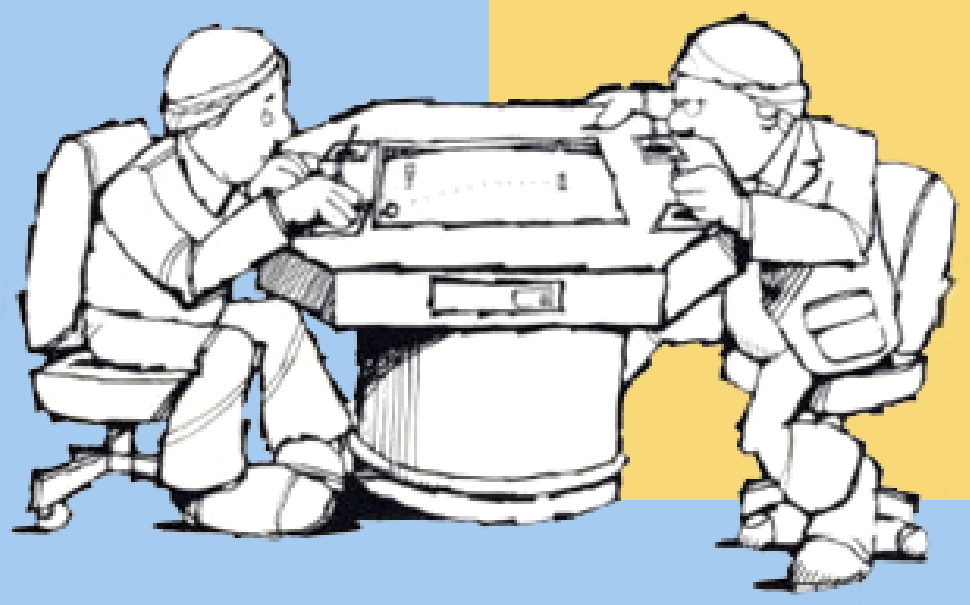
Meadows 4 In 1

Manufacturer *Meadows*
Release *1976*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *4 Players simultaneous*
Gameplay *Team*
Panel Layout *Multiple Player*
Controls
Joystick: *Analog*
Buttons: *1 [Speed Control]*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Cocktail*

MEADOWS 4 in 1

Meadows 4 In 1 is a combination game that includes four games designed for one to four players; "Flim-Flam Tennis," "Flim-Flam Hockey," "Knockout," and "Knockout Doubles."





excerpt from the flyer:

It's the Bob & Carol and Ted & Alice game. Four times as many games results in four times as many dollars for the operators and fun for the players which all means this cousin of Flim Flam will sell 60.000. Play tennis, hockey, singles knockout and double knockout. Of course, if Bob wants to play by himself he can.

Moto-Cross, the original release from what was rebranded Fonz: The Game is a motorbike variants of Road Race, a car driving game released in February 1976.

Moto-Cross is an early black-and-white motorbike racing game, most notable for introducing an early three-dimensional third-person perspective. The game display a constantly changing forward-scrolling road and the player's bike is in a third-person perspective where objects nearer to the player are larger than those nearer to the horizon, and the aim is to steer the vehicle across the road, racing against the clock, while avoiding any on-coming motorcycles or driving off the road. The game also introduced the use of haptic feedback, which caused the motorcycle handlebars to vibrate during a collision with another vehicle.

excerpt from the flyer:

WIN THE RACE
FOR PROFITS.

Ride MOTO-CROSS and you'll know why this game will be your hottest attraction. Because the player experiences all of the sensations and risks of riding a *real* motorcycle in *real* competition. Even the sounds are authentic.

The object is to maintain as high a speed as possible without hitting the other racing motorcycles on the screen or skidding off the edge of the road. Turn the handlebars, and you corner and bank with startling realism. Twist the hand throttle open, and you accelerate with the rising scream of your high compression engine. Collide with another racer — the handlebars vibrate and the TV screen flashes a reverse image.

Scoring with MOTO-CROSS is beautifully simple: 10 points per second at the slowest speed; 10 points every half-second at top speed. A crack-up costs three seconds of no-score. If the total score goes above 1000 kilometres, the extended play lamp goes on — and so does the player.

To increase the challenge the size off the bikes can be regulated by the operator. Game time is adjustable from 45 to 100 seconds.

What about reliability? Excellent. MOTO-CROSS is a solid state game, so there's little to go wrong.

Moto-Cross

Manufacturer	*Sega*
Release	*1976*
Class	*Wide Release*
Genre	*Racing*
Mode	*1 Player*
Gameplay	*Single*
Panel Layout	*Single Player*
Sound	*Amplified Mono (one channel)*
Cabinet Styles	*Upright*

• Realistic imagery. Both road and bikes are seen in true perspective so that objects nearest the bottom of the screen (closest to the player) are larger than those on the horizon or top of screen.
• Handlebars function identically to those of a real motorcycle.
• Full range speaker produces all racing sounds with realistic impact.
• Play time is adjustable from 45 to 100 seconds.
• SEGA-built solid state electronics assure maximum reliability and ease of servicing.
• Ruggedly constructed cabinet is styled for customer appeal and high trade-in.

Night Driver

Manufacturer *Atari*
Release *1976*
Class *Wide Release*
Genre *Racing*
Mode *2 Players*
Gameplay *Alternating*
Panel Layout *Single Player*
Controls
Steering: *Wheel*
Shifter: *4-position (1/2/3/4)*
Pedals: *1*
Game Specific: *Night Driver Pinout*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White with a Color Overlay (a sticker of a car placed at the bottom center of the overlay)*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright Cockpit*

Night Driver, developed by Atari, was inspired by the earlier German coin-op Nürburgring 1. Along with Micronetics' Night Racer and Midway's 280 ZZZAP, Night Driver is one of the earliest first-person racing video games, and is commonly believed to be one of the first published games to display real-time first-person graphics.

The player controls a car which must be driven along a road at nighttime without crashing into the sides of the road as indicated by road side reflectors. The game is controlled with a single pedal for gas, a wheel for steering and a four-selection lever for gear shifting. The coin-operated game had a choice of three difficulties, novice, pro, and expert, from which the player could choose at game start. The turns were sharper and more frequent on the more difficult tracks. As play progresses, the road gets narrower and more winding.

The game length could be set by the owner to 50, 75, 100, or 125 seconds. After 300 points, a player is awarded bonus time equal to game time, but the score wraps around back to zero at 1000 points, so it is possible to reach 300 points more than once. Due to the additional points received for more difficult play, playing on the expert setting is actually the easiest to achieve extra time once a player has mastered the game.

Due to the limitations of arcade technology at the time, the car the player is driving is not actually drawn on-screen. Instead, the car is a printed plastic insert that is laid under the screen. Also, the fact that the car is driving at night made it easier for the programmers to draw the environment with limited graphics at the time, as most things (street, buildings, ...) didn't need to be drawn because they were supposedly completely dark.

There were two versions of the cabinet manufactured, an upright and a cockpit. The upright version had a blacklight installed inside the cabinet which illuminated the bezel.

After the success of the arcade, Rob Fulop ported the game to the Atari 2600. It uses the paddles to control the vehicle. The player pushes the fire button to accelerate the car forward, and uses the paddle to steer the vehicle; it is not possible to shift gears in this version. This version includes features not present in the coin-operated version, such as additional vehicles the player must avoid as well as showing houses and trees along the sides of the road.

excerpt from the flyer:

Another Atari First! Racing action at night.
Now from Atari stable of high profit-scoring racing machines comes the *first* game to offer players the excitement of night racing.

New Night Driver places the driver in the cockpit of his own Sebring type racer.

The monitor displays a twisting, curving, road ahead. The harder the acceleration, the faster the track comes at player.

Screeching tires around curves, crashes against road barriers, the whine of changing gears add to the fantastic realism.

Three different tracks.
Players can select "Novice," or "Expert" tracks based on degree of skill needed — keeps players coming back to try again and again.

Scoring.
Players can compete with themselves or other players for highest top speed and number of points (based on "distance" traveled.)

New Operator options.
Extended play bonus. Extended play can be

awarded when driver scores 350 points. (Operator sets difficulty.)

Game time. Can be adjusted to 50, 75, 100 or 125 seconds.

New Tracks! To keep Night Driver always a fresh challenge, a switch is provided inside that lets you change to a different set of 3 courses.

New "Blacklight" graphics.

The ultimate in realistic nighttime simulation. A unique ultraviolet light illuminates car on screen and instructions on the monitor bezel.

Less time in the Pits.

Endurance comes standard. Exclusive Durastress™ tested solid state reliability, rugged construction, and all metal foot pedal means your crew can sit back and watch the earnings grow whit each mile without hassles.

And Instapart™ 24-hour parts turnaround delivers spares anywhere, anytime.

Exclusive self-test program is built in. The program allows testing of all switches including gas pedal and gear shift. Check all *microprocessor* and *memory functions*. It also reads out game option switch position on the computer board.

Dimensions

(Upright)

Height: 72", 182.88 cm; Width: 25.25", 64.14 cm; Depth: 29", 73.66 cm.

Dimensions

(Cockpit)

Height: 55", 139 cm; Width: 30", 76 cm; Depth: 67", 170 cm; Weight: 282 lbs, 128 kg.

- Drivers can select "Novice", "Pro" or "Expert" tracks.
- Players compete for highest top speed and points based on "distance" travelled.
- "Best" top speed and score previously achieved is displayed when track selection switch is activated.
- Built-in self-test program.
- Operator adjustable game time to 50, 75, 100, or 125 seconds.
- Optional Extended Play for 350 points (operator sets difficulty).
- Inside switch lets operator select a different set of 3 tracks.

excerpt from the flyer:

"'I'd like to introduce out new fall line"

"We can't show it all completely yet. But it's here. More innovation than you've ever seen. Games that literally defy imagination. Giant realism. More player challenge. Spectacular excitement expressed in the biggest mind-boggling array of sports, driving and action themes we've ever offered. Themes translated into the most advanced video and non-video games in the world.

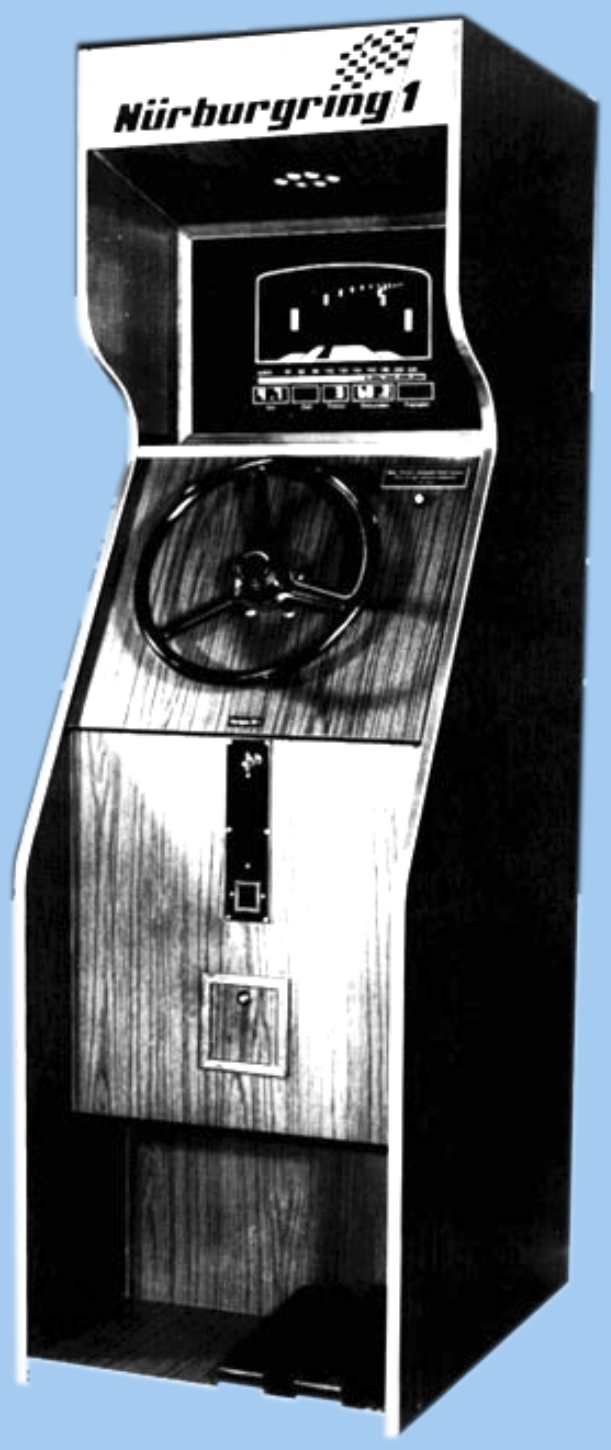
"Games like new Night Driver,™ Sebring-type night racing against the clock. And Sprint 2,™ the game that's 12 games in one. One or two players can choose from 12 different race course layouts. And the fantastic new F-1,™ a one player larger-than-life attraction. Players drive in a full-size cockpit in front of a giant projected race course, complete with moving track and cars.

"Along with irresistible built-in player appeal, we've also built in more operator options, self-diagnostic features and unique microprocessor technology for long lasting, higher earnings.

"You can sample the future soon. All the magic and excitement begins at MOA and IAAPA."

Nuerburgring 1

Manufacturer	*Dr. Foerst Gmbh Germany*
Release	*1976*
Class	*Wide Release*
Genre	*Racing*
Mode	*1 Player*
Panel Layout	*Single Player*
Cabinet Styles	*Upright*



Nurburgring-Powerslide, a driving simulator from Germany, was created by German engineer, Dr-Ing. Reiner Foerst.

Dr. Foerst had no interest in games, as such. His interest was in simulators (and that's exactly what his company makes today). As he himself said:

"My invention of a driving simulator was not initiated by any interest in games, but rather an interest in Simulation theory and engineering."

However, to raise money, he planned on making an arcade version of his simulator first. He checked out BP's and Volkswagen's elaborate early driving simulators, which were projection-based for BP, and a oscilloscope-based one for Volkswagen. Both were wildly complex and expensive. Foerst realized there was no way these technologies would scale down enough to make a viable game.

After some abortive attempts with light-bulb based displays, Foerst found his solution when he encountered a Pong machine in 1973. He acquired one, ripped it apart, and started designing his own TV-screen based driving simulator based on the nascent video game technology he found in Pong.

The result, like Pong, used no CPU, employing many discreet dedicated circuits for the game. The game, called Nurburgring 1, had 28 separate cards mounted in a huge rack. For comparison, Pong used one. The visuals were simple, but effective. The twisting roadway was defined by a series of rectangular white "posts" on either side. The background was just black, but the lower portion of the screen had a speedometer, mileage and other indicators. There was also an image of the hood of the players car, but that was a vinyl appliqué and not electronically generated.

When Dave Shepperd, from Atari, was given the assignment to program Night Driver in 1976 he *"...was given a piece of paper with a picture of a game cabinet that had a small portion of the screen visible. I don't recall if it was an actual flyer for the game or simply a Xerox of the front page of the flyer. I recall it being German or maybe I was just told it was a German game. I never saw the game play nor did I know what scoring was used on that game, only that there were a few little white squares showing. With that germ of an idea, out popped Night Driver."*

Atari was much better about making the game cheap to produce (using one board instead of almost 30 boards) so they, along with some other copycats, dominated the segment instead of Nurburgring-Powerslide.

Dr. Foerst, denied massive arcade successes because of the rampant copycats, remained undaunted, producing several other versions of the Nürburgring game series. Number two was motorcycle inspired (handlebars replaced steer ing wheel), three was full color with selectable backgrounds. Nürburgring Power-Slide and Nürbergring Turn-Table were moving cabinets, with Power-Slide banking the driver's seat angle and Turn-Table rotating the entire cabinet to match the direction of steering.

Today, Foerst's company makes simulators, but he's still largely unknown as the father of first-person driving games.

"Jason Torchinsky@jalopnik.com"

Outlaw

Manufacturer *Atari*
Release *1976*
Class *Wide Release*
Genre *Light-gun*
Mode *1 Player*
Gameplay *Single*
Panel Layout *Single Player*
Controls
Gun: *Optical*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Conversion Class: *Atari B&W Raster*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Outlaw, originally released in 1976, was a response to Gun Fight, released by Midway in North America the year before.

Players select one of two characters: Half-fast Pete or Billy-The-Kid. Pete is more accurate while Billy can draw faster. An outlaw appears somewhere in the town, the object being to fast draw the gun as soon as he draws his. Shooting him before he shoots the player scores points, with points counting toward end-of-game ratings such as "Dude", "Greenhorn", and "Top Gun".

The game is housed in a custom cabinet that includes a light gun. The game PCB is composed of discrete technology, with game sprites stored in ROM. Playfield graphics are provided by a screen overlay representing an Old West town street.

A home console port was developed for the Atari 2600 by then-Atari employee David Crane. This version is more directly comparable to Midway's Gun Fight, allowing two players to engage in a shoot-out using 2600's joysticks. There are also multiple types of play that differ slightly from the arcade game, including target practice and versions with obstacles that must be shot around or shot through.

excerpt from the flyer:

OUTLAW is a new concept in video entertainment. OUTLAW invites the player for the first time to physically match his skill against a video gunfighter in one of America's most traditional contests... the fast-draw shootout.

Top Gun Realism.

Players fast-draw a full scale replica of a Colt.45.

A video gunfighter swaggers out from behind buildings in an authentically illustrated western town (the graphics are on the monitor), turns and waits... and fires! Players have to shoot first and straight to aviod being "hit."

Realistic animation, audio footsteps and gunfire add up to irresistible realism.

More Options than ever keeps 'em trying.

Player options. Players can select higher skill fast-draw times — "Half-fast Pete" or "Billy-the-Kid" (amount of time video outlaw waits before firing).

Operator options. OUTLAW can be adjusted to the number of hits needed to achieve "Dude", "Greenhorn" or "Top Gun" end-of-game ratings.

OUTLAW can also reward "Top Guns" with extended plays at operator's selection.

Warning panels flash if gun is drawn before outlaw stops running of if gun is not returned to holster before next shootout sequence. Game automatically shuts off if gun is left out of holster for an extended time.

Hair Trigger features.

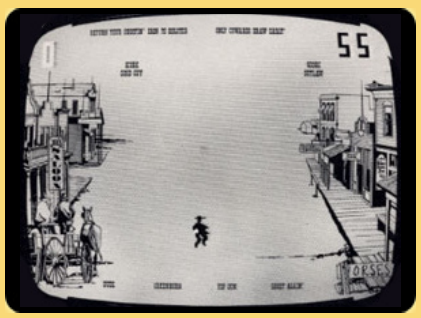
Atari *standard* features include large 23" monitor, locked cashbox, hinged cash door, Durastress™ tested solid state reliability, and attention-getting cabinet graphics.

Instapart™, U.S. Cavalry of the Seventies.

24-hour parts turn-around is available to keep your profits coming non-stop.

Dimensions.

Height: 56 1/2", 143.5 cm; Width: 31 1/2", 80 cm; Depth: 27 1/2", 69.8 cm.



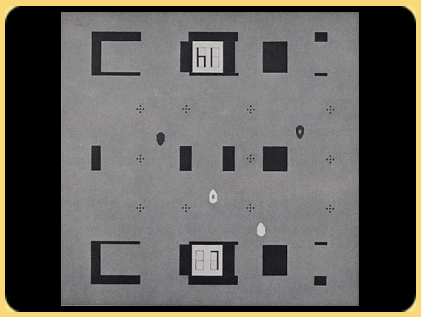
PT-109

Manufacturer *Mirco*
Release *1976*
Mode *4 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Monitor
Orientation: *Either*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Table (4-Player)*

PT-109 is a one- to four-player sea battle game with PT-boats and battleships. PT-109 was a real PT boat (Patrol Torpedo boat) last commanded by Lieutenant, junior grade John F. Kennedy in the Pacific Theater during World War II.

Located in Phoenix, Arizona, Mirco Games was primarily known for its foosball tables and for producing the first pinball game with a microprocessor. Mirco's first non-ball-and-paddle video game was PT-109, one of the forgotten breakthrough games of the video Bronze Age. The game itself was a naval combat game in which 2 or 4 players navigated around islands, mines and other hazards while attempting to blast one another with torpedoes and howitzers (in 4-player games, each 2-person team consisted of a PT-boat and a battleship). What truly set it apart, however, was that it used a microprocessor – one of the first video games to do so. The game was on display in Mirco's booth at the 1975 MOA show in October – the same show where Midway debuted Gun Fight, generally considered to be the very first microprocessor video game.

Despite the innovation, PT-109 sold poorly. By the time it appeared, the cocktail video boom had passed and the same doctors and lawyers were unwilling to buy another video game (PT-109 was only produced in a cocktail cabinet). As a result, PT-109 is all but unknown today, and even the most ardent video game collector is probably unaware that it had a microprocessor, much less that it was one of the first video games to use one. It's a bit ironic since the one Mirco game that Micro is most know for is the pinball game it introduced at the very same show called Spirit of '76 – which has long been considered the first to released pinball game with a microprocessor. While Mirco released it, Spirit of '76 had been designed by one of pioneers of the coin-op industry – Dave Nutting. Nutting had developed the game after Bally chose to pass on the Flicker prototype he and Jeff Frederiksen had developed in 1974.



"allincolorforaquarter.blogspot"

excerpt from the flyer:

"READY, AIM, FIRE!"

The new 2-4 player video game that puts you ON TARGET for higher profits.

All-out war on the high seas! MICRO's PT-109 packs more firepower than the Pacific Fleet. As a 2-player game, PT-109 is a matchup of swift, highly manoeuvrable torpedo-firing PT-boats. *Three-speed forward and 1-speed reverse drive* propels boats around islands, sea mines and other hazards. And developers inertia to test navigating skills.

But a torpedo is limited by range and natural barriers, so MICRO adds a 4-player option — *Battleships!* Larger, slower, twice as deadly. With howitzers that can blast over island tree tops. Now there's no place to hide. Each torpedo boat/battleship team must outmanoeuvre the enemy — or sink!

• **Special effects.** A complete arsenal, in quad sound. From the whoosh of torpedoes to the grinding of steel hulls. Engine rumbling, booming cannons, screaming shells and explosive direct hits. All the realism players ask for

• **Computerized random selection.** Insures that a sinking ship resurfaces in a new, unknown location. No sitting ducks, more challenging play.

• **Screen interlace.** Produces sharp, crisp images to allow precision aim. Torpedos and shells home-in on targets with lethal accuracy.

• **360° killing radius.** No "dead spots" on the screen. Players are limited only by the range and characteristics of their weapons. Aim — not the whims of the machine — is the critical factor.

• **Pre-game show.** Video display of PT-boats circling islands, minefields.

• **Top-mounted controls.** For smooth, concise navigation and firing.

PT-109 is an operator's dream.

• **Microcomputer controlled.** Cabinet top flips open, sides drop to expose conveniently located printed circuit boards. Pull out one, pop in another. Ease of replacement means less down time — *much* less.

• **Fully fused.** All components are protected against overheating.

• **Playing time.** Operator controlled. Set for 1, 2 or 3 minutes.

Quiz Show

Manufacturer	*Kee Games*
Release	*1976*
Class	*Wide Release*
Genre	*Trivia/Quiz*
Mode	*2 Player simultaneous*
Gameplay	*Competitive*
Panel Layout	*Multiple Player*
Controls	
Buttons:	*4 [Answer 1|Answer 2| Answer 3|Answer 4]*
Buttons:	*1 [Catagory Select]*
Monitor	
Orientation:	*Horizontal*
Type: Raster:	*Standard Resolution*
CRT:	*Black and White with a Color Overlay*
Sound	*Amplified Mono (one channel)*
Cabinet Styles	*Upright*

Quiz Show is a two-player computerized version of a quiz show. The game presents multiple choice answers to questions from a range of categories.

The game asks the players questions and they press the corresponding button on the side of the screen to answer. Questions are multiple choice, chosen from a pool of 1000 questions in four categories: people, sports, movie, and potpourri. Categories are chose prior to the game's start. Points are awarded for a correct answer, with point deductions for incorrect answers. Bonus points are also awarded, and are based on the length of time it takes to answer the question. At the end of game play, the player is given a rating of Dunce, Lucky, Smart, or Genius based on their score.

The game is housed in a custom cabinet that includes two sets (one set per player) of four buttons on each side of the monitor. The game PCB uses a Signetics S2650 cpu, with all questions and answers stored on a removable 8-track audio cassette tapes that are streamed to the game. Additional tapes could be purchased with alternate sets of questions. It is unclear whether this was an 8-track tape or a normal cassette. The sideart has a picture of Laurel and Hardy, plus Mickey Mouse, a biplane, Benjamin Franklin, etc. all merged around the heading 'Quiz Show'.

excerpt from the flyer:

And now ladies and gentlemen, the star of our show... Quiz Show! It's all new. A different video quiz game with all the excitement and suspense of the real thing.

It's designs for top 2-player attraction in any location. Attention-getting graphics and over one thousand different questions in four categories provide variety, fun and mind-boggling entertainment for contestants of all ages.

And its compact size lets you place the game anywhere.

Say the secret word and win...

Quiz Show asks 250 different questions in each category. Players can select "sport", "general knowledge", "movies" or "people".

Each question displays four possible answers which appear in different colors. Hit the colored button on the control console that corresponds to the correct "answer" color on the monitor, the contestant scores. High for a fast answer, low if it's a head-scratcher.

Player can test him or herself, or challenge a partner for highest score.

You MC the Show...

And the profits! Quiz Show is operator adjustable for extended play (depending on scoring). And for 25¢ per single player or 25¢ for 2 players. You control end of game by time or by number of question and answer tapes are available from your Atari distributor.

Repeat play is built in for longer location life, higher earnings.

RACE!

Race is an auto racing game from Fun Games Inc.

excerpt from the flyer:

At last a realistic race track requiring definite skills and negotiate the many turns and obstacles (oil slicks and wrecked cars). An evolution of your driving ability is displayed on the screen upon completion of your run and with practice you'll be ready for the Pro Circuit!

Race is a one or two player game that provides fierce competition for the players and greater earnings for you.

Rugged metal foot pedal, steel steering and shift mechanisms, together with an attractive low profile cabinet means: Race is a profit winner day after day in any location.

Pitstop support in 24 hours! Replacement and repair parts are available on 24-hour schedule anywhere. Consistent earnings without problems. The name of our game is service.

Race

Manufacturer *Fun Games Inc.*
Release *1976*
Class *Wide Release*
Genre *Racing*
Mode *2 Players*
Gameplay *Alternating*
Panel Layout *Single Player*
Controls
- **Steering:** *Wheel*
- **Shifter:** *2-position (low, high)*
- **Pedals:** *1*

Monitor
- **Orientation:** *Horizontal*
- **Type: Raster:** *Standard Resolution*
- **CRT:** *Black and White*

Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Ricochet

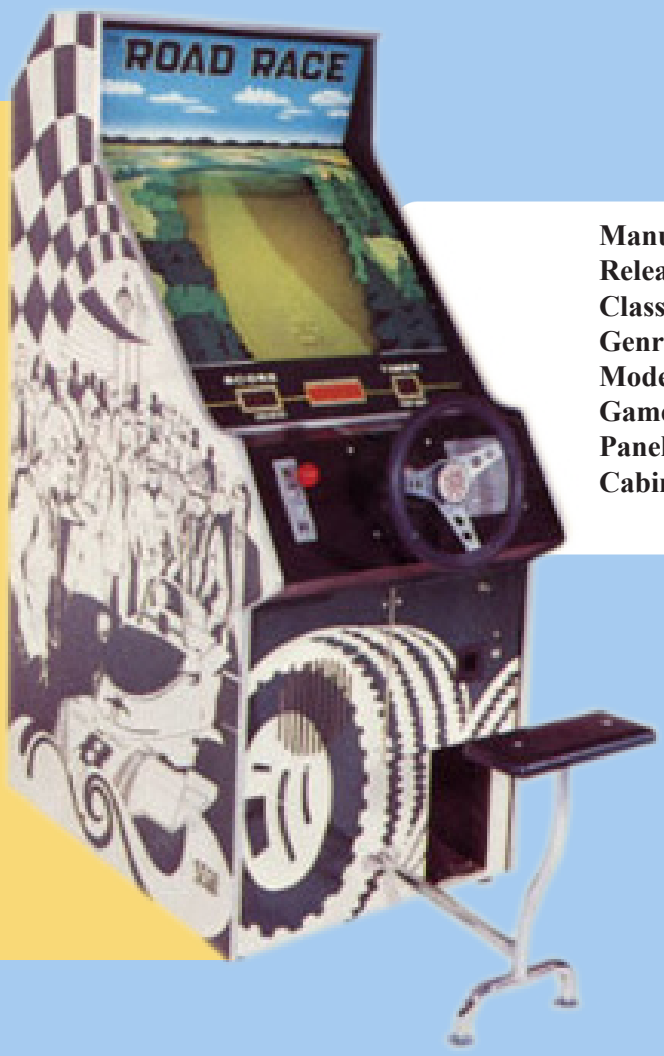
Manufacturer *Nutting Associates*
Release *1976*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *2 Players*
Gameplay *Alternating*
Panel Layout *Single Player*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White with a Color Overlay*
Sound *Unamplified Mono (requires one-channel amp)*
Cabinet Styles *Upright*
Cocktail

Ricochet is a breakout-style ball-and-paddle game with a grid of sixteen widely-spaced blocks and pockets along the top and side edges of the playfield. Hitting a block once removes it, earns points, and bounces the ball. Hitting a pocket earns points and holds the ball for a moment.

Hardware architecture is discrete digital logic chips with no microprocessor paddle control is purely analog. Cabinet includes a two-tone doorbell chime for bonus sound effects.

Ricochet was Nutting's last arcade game.

"arcade-museum.com"



Road Race

Manufacturer *Sega*
Release *1976*
Class *Wide Release*
Genre *Racing*
Mode *1 Player*
Gameplay *Single*
Panel Layout *Single Player*
Cabinet Styles *Upright*

SEGA ROAD RACE

Road Race was an early driving/racing game developed and published by Sega in early 1976. The game was notable for its introduction of a pseudo-3D, third-person perspective.

Later in 1976, Road Race was adapted into the motorbike racing games Moto-Cross and Man TT, which in turn was re-branded as Fonz in North America.

excerpt from the flyer:

"Here's one for the road... SEGA'S HOT NEW DRIVING GAME

A real wall-smacker of a driving game, designed for the racing buff who loves the feel of the wheel in his hands while the challenges to his skill comes thick and fast.

ROAD RAGE is a single-player thrill machine, with a 23-inch video screen projecting a constantly changing "S" shaped road course, with two obstacle race cars moving aggressively along the road. Collisions with obstacle cars are accompanied by outstandingly real audio effects.

Rock’n Bark

Manufacturer *Sega*
Release *1976*
Mode *2 Players simultaneous*
Gameplay *Joint*
Panel Layout *Multiple Player*
Hardware *Sega Discrete Logic*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Color*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Rock’n Bark is a 1 or 2 player shooting game where the players, using positional guns, shoot various on-screen targets.

Rugby

Manufacturer *Sidam*
Release *1976*
Class *Wide Release*
Genre *Video Pinball*
Mode *2Players*
Gameplay *Alternating*
Panel Layout *Single Player*
Monitor
Orientation: *Vertical*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Sea Battle

Sea Battle is a seagoing war game where ships battle it out with each other.

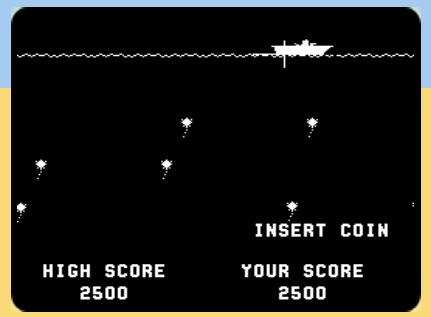
excerpt from the flyer:

- Realistic Sounds
- Exploding Shells
- Grinding Hulls
- Ships Manoeuvre Entire Screen
- Blow Away Islands
- Hide in Coves
- Rumbling Engines
- 23” Monitor
- 8 Moving Mines

Manufacturer *Ramtek*
Release *1976*
Class *Wide Release*
Genre *Shooter*
Mode *4 Players simultaneous*
Gameplay *Team*
Panel Layout *Multiple Player*
Controls
Joystick: *8-way with button [Fire]*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Sea Wolf is an arcade game by Midway, originally released in 1976. It was a video game update of an earlier coin-operated electro-mechanical Midway game, Sea Devil, itself based on Sega’s 1966 coin-op electro-mechanical arcade submarine simulator Periscope. Midway’s video game version was designed by Dave Nutting and eventually sold 10,000 video game arcade cabinets.

In 2008, Coastal Amusements released a “retro video” redemption game based on the original Sea Wolf, released by Midway in 1976. It is a 3D remake.



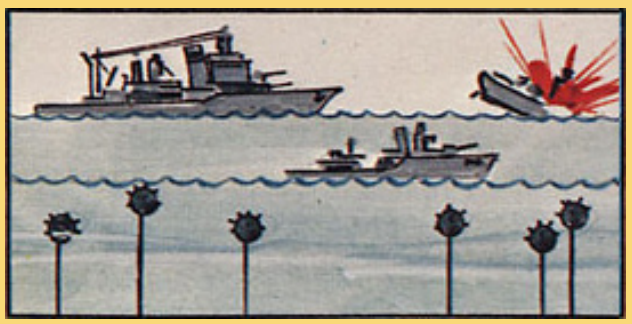
Sea Wolf

Manufacturer *Midway Manufacturing Co.*
Release *1976*
Class *Wide Release*
Genre *Shooter*
Hardware *Midway 8080*
Settings *Sea Wolf Dipswitch Settings*
Mode *1 Player*
Gameplay *Single*
Panel Layout *Single Player*
Controls
Periscope with button [Fire]
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

The player looks through a large periscope to aim at ships moving across the virtual sea line at the top of the screen, using a thumb button on the right handle of the scope to fire torpedoes. The periscope swivels to the right and left, providing horizontal motion of a targeting cross-hair. The cabinet features a mixture of video game and older electro-mechanical technology for player feedback. Using back-lit transparencies reflected inside the scope, the number of torpedoes remaining are displayed, as well as a red "RELOAD" light which lights up momentarily when the player has launched five torpedoes. Additionally, when ships are hit on the screen, an explosion "light" is reflected inside the scope. A blue overlay is affixed to the screen to provide a "water color" to the sea. Sounds include a sonar ping and the sound of the PT boat racing across the screen.

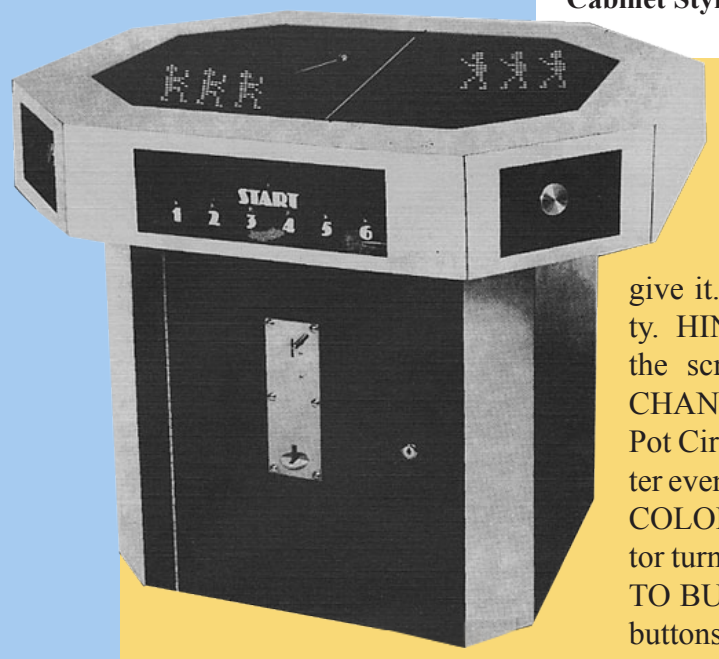
Sea Wolf is time-limited, with the player having an opportunity to win bonus time by reaching an operator-set score. The player's score is shown on the bottom half of the screen as well as the high score, one of the first known instances of a high score in a video game. Targets include destroyers, a fast-moving PT boat, and mines floating across the screen that serve as obstructions.

The ROM chips tend to get warm and slightly pop out of their sockets. Random game behaviour strange shapes or garbage on the screen, or a game crash can usually be cured by gently reseating the chips.



Six-Pac

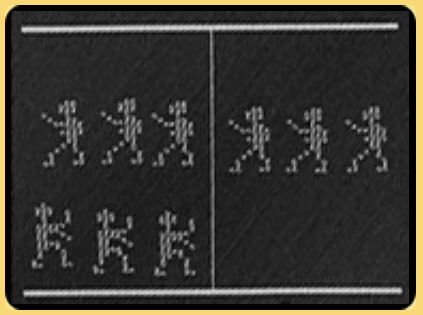
Manufacturer *American Video Games*
Release *1976*
Class *Prototype*
Genre *Sports*
Gameplay *Either*
Panel Layout *Multiple Player*
Conversion Class: *dedicated*
Monitor
Orientation: *Horizontal*
Type: *TV Monitor*
CRT: *Black and White with a Color Overlay*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Cocktail*



excerpt from the flyer:

STARS INCLUDE

- 6 Exciting Action games
- 10 Different Sound Effects
- 23" Motorola Monitor
- Full Color Display
- 3 Ways to Win Free Games
- 21 Exciting Playfields
- 2 Action Attract Mode
- 1-2-3-4 Players



FEATURING

GENUINE FORMICA and sturdy PLYWOOD CABINET will withstand all the abuse you can give it. Tempered glass for added safety. HINGED TOP for easy access to the screen and all controls. NEVER CHANGE A POT with exclusive Time-Pot Circuitry. CLUTCH ACTION to deter even the roughest players. LIGHTED COLOR INSTRUCTIONS on the monitor turn on after each game. NO BULBS TO BURN OUT with LED game select buttons. 23" MOTOROLA MONITOR and SIX-PAC logic board both warranted for ONE FULL YEAR. REAL ROBOTS on the screen lob, run, kick, butt, hide, dribble, catch, throw and occasionally miss the ball. TEN EXCITING SOUNDS include the WHISH of a high speed serve. Scores RING like a sophisticated pinball. Every man has his own unique sound and novel ZING for every catch!! Introducing MATRIX-VISION for easy viewing. GOLD PLATED logic board and speacial PC board to run LED game controls are joined with REMOVABLE RIBBON CABLE to free game of usual maze of wires. OPERATOR ADJUSTABLE scoring and locking steel coin vault that holds $800, make this table the new state of the art.

Sky War

Manufacturer *Micro Amusements Inc.*
Release *1976*
Class *Wide Release*
Genre *Other*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Joystick: 2-way (up, down) [Throttle]
Joystick: 2-way (up, down) with button [Climb/Dive/Shoot]
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White with a Color Overlay. Blue overlay with white clouds, mountains and an airport on the bottom.*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*
Cocktail

Note:
"These two Sky War/Skywar games may be the one and the same. I tried to find more information other than the few bits of gameplay info and advert pictures, but was unsuccessful. I could not find out if Micro Amusements Inc. is the same company as Micro Games, but the chance of two games by the same name being released in the same year by companies named Micro is just to big. I could not find any bezel pictures of Micro Games Sky War, and the black-white pictures does not look alike. Also the cocktail of Micro Amusement are also slightly different than that of Micro Games. But my guess is that the two games are the same and made by Micro Games..."

Sky War

Manufacturer *Mirco Games*
Release *1976*
Class *Wide Release*
Genre *Shooter*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Cabinet Styles *Upright*
Cocktail

Skywar is a dual-joystick, World War I, air combat game.

Sky-Tack

Manufacturer *Innovative Coin*
Release *1976*
Cabinet Styles *Cocktail*

excerpt from the flyer:

SKY-TACK
The Exciting Air-Battle Skill Game for everybody

Sky-Tack has it all: competition; crowd-attracting aerial action; roaring engines; blazing guns; explosions; the thrill of victory; and the agony of defeat.

It's the new idea in games.

How Is It Played?

The players drop in 25 or 50 cents. Each takes the charge of a fighter plane by grasping the trigger/joystick. The the fun begins.

The planes takes off. Each manoeuvres around the colorful screen, trying for position to fire and destroy the enemy. You see and hear the sounds of battle. Finally, the enemy is in the gun-sights. The player's hand tightens on the joystick. He fires; he misses. He tries again. A hit!

The enemy plane belches fire and smoke, then plunges to earth — and explodes.

Of course, out winner can't wait to drop in another coin to prove it was pure skill on his part. And the loser can wait for revenge — at 50 cents per game.

What About Profits?

Profits are big — and fast. Because everyone can (and loves to) play Sky-Tack. So you can locate Sky-Tack anywhere — lobbies, cocktail lounges, restaurants, cafeterias — anywhere people come together. Its colorful action — and battle noises — attract more potential players.

Combine this with Sky-Tack's initial lower cost, and solid state long-life and serviceability, and you have a sure winner.

Don't forget. Your audience is pre-sold, thanks to movies and TV. Everybody loves a good air-battle. You don't have to pre-educate them, and that means fast profits.

How About Durability and Reliability?

Sky-Tack brings true solid-state dependability to the game industry.

Sky-Tack has the most advanced design of any game on the market. Its uses a microprocessor, a tiny computer CPU (central processing unit) which is the most revolutionary idea in solid state electronics since the integrated circuit itself.

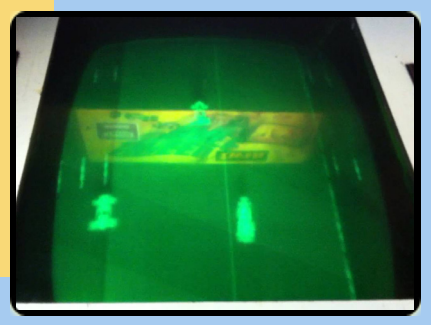
Speed Race Twin

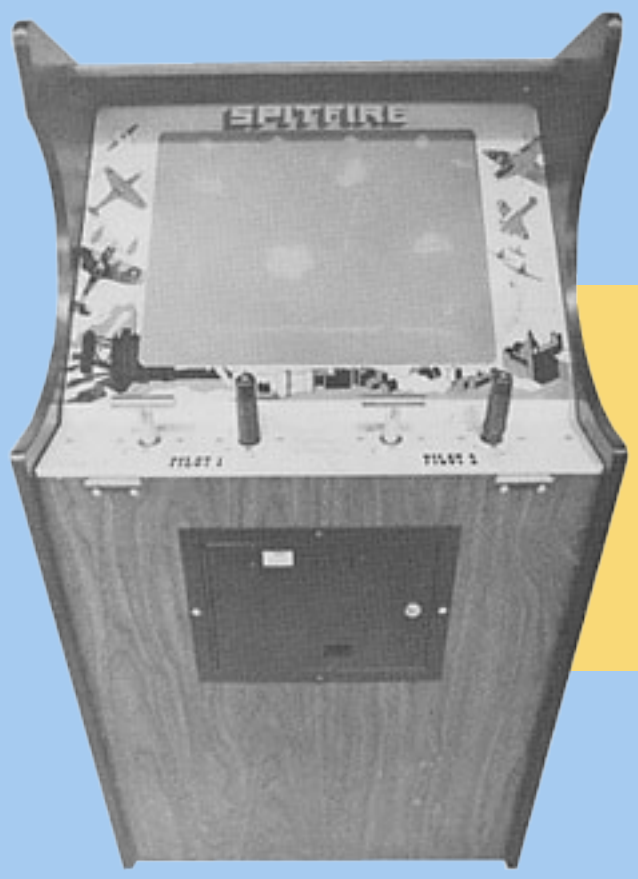
Speed Race Twin is a racing arcade game, that was released by Taito in 1976; as the name suggests, it is the sequel to Speed Race (which was released two years earlier).

Players must again use a steering wheel and gear shifter, to take up control of a car, with a single pedal to make it accelerate - but this time, two players can play simultaneously. When either player's car crashes into a guard rail, or a CPU-controlled car, it will automatically get sent back to the start; however, if either player's car crashes into the other player's the one which was ahead at the time of impact will stay in position while the other one shall get sent back to the start. When either player's car rams one of the round obstacles on the track it will be bumped aside - and when driving in a "Slip Zone", carried over from that original "Speed Race", turning the steering wheels rapidly will cause the cars to slide out of control. The gameplay will also, as in the original game, be extended at 2000, 4000 and 6000 points.

"strategywiki.org"

Manufacturer *Taito*
Release *1976*
Class *Wide Release*
Genre *Racing*
Mode *2 Players simultaneous*
Gameplay *Joint*
Panel Layout *Multiple Player*
Monitor
Orientation: *Vertical*
Type: Raster: *Standard Resolution*
CRT: *Color*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*





excerpt from the flyer:

Spitfire
The Exciting Air-Battle Skill Game for everybody

Spitfire has it all: competition; crowd-attracting aerial action; roaring engines; blazing guns; explosions; the thrill of victory; and the agony of defeat. It's the new idea in games.

Spitfire

Manufacturer *Innovative Coin*
Release *1976*
Class *Wide Release*
Genre *Shooter*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Joystick: *8-way with button [Fire]*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Sprint 2

Manufacturer *Kee Games*
Release *1976*
Class *Wide Release*
Genre *Racing*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Steering: *Wheel*
Shifter: *4-position (1/2/3/4)*
Pedals: *1 [Accelerate]*
Hardware *MOS Technology 6502*
Game Specific *Sprint 2 Pinout*
Settings *Sprint 2 Dipswitch Settings*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (two channel) independant dual channel*
Cabinet Styles *Upright*

Sprint 2 is a 2 player overhead-view arcade racer released in 1976 by Kee Games. It was the first auto racing arcade game to use a CPU to control part of the game. It was released two years after Sprint 2 and both games have the same type of play. The "1" and "2" designations have nothing to do with a prequel/sequel status, but merely reflect the number of players required for each game.It evolved from Gran Trak 10 and Gran Trak 20, but included a microprocessor (the 6502), a first for racing games. This allowed Sprint 2 to include two computer-controlled cars, better graphics, and more tracks. Unlike Gran Trak, this machine did not have brake pedals, but the players could still make their cars "fishtail" by turning their steering wheels abruptly.

Players could select between about a dozen tracks where oil slicks and other cars opponent or neutral cars could make you lose control. Ratings: Granny, Rookie, Pro. Bonus time extra 30 "seconds" for completing enough laps.

Sprint 2 was believed to be the first Atari product to feature the well-known 'Atari arcade font'.

excerpt from the flyer:

Drivers can select from 12 different tracks. Players can select a different track each time they drive with a push of a button. Makes Sprint 2 always a new driving challenge. Keeps players coming back again and again. **It's like 12 games in one!**

New microprocessor technology means more realism, faster action.

One player racing. A solo driver sprints against the clock in a white car. But he's not alone. He also compete against a black and 2 gray cars that drive automatically.

Two-player racing. A second driver races the black car against a white car and the two gray sprint cars. Hitting other cars causes temporary loss of game time.

New monitor graphics flash driving instructions. "game over," and "Granny," "Rookie," or "Pro" ratings according to scores achieved.

Operator Options:

Extended play. New player and profit incentive. Extended play is awarded after a pre-programmed score (different for each track) is reached by the driver.

In a 2-player race, extended play is given to both players as soon as one driver achieves the pre-determined score.

Extended play gives players 30% more game time, gives you more repeat, extra earnings.

"Extended play" also flashes on the monitor along with a numeric count-down in seconds for the extra ride.

Game Time. Game time is operator adjustable. Extended play also self-adjusts automatically to whatever game time has been pre-selected.

Squadron

Manufacturer *Sega*
Release *1976*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Squadron is an aircraft fighting game for one or two players with control yokes that allow the player to shoot down enemy planes.

"mobygames.com"

Starship 1

Manufacturer *Atari*
Release *1976*
Class *Wide Release*
Genre *Space*
Mode *1 Player*
Gameplay *Single*
Panel Layout *Single Player*
Controls
Steering: *X/Y-directional yoke with common thumb buttons [Fire]*
Other *[Photon Torpedo]*
Hardware *Atari System 16*
Conversion Class: *Atari BW Raster*
Game Specific *Starship 1 Pinout*
Settings *Starship 1 Dipswitch Settings*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
The game uses a half-silvered mirror to reflect the image over a black light lit space background. The monitor has a ''a target cross-hairs taped directly onto the monitor to aid in lining up enemy ships.
Sound *Amplified Mono (one channel) speaker on each side of the cabinet facing*
Cabinet Styles *Upright*

The object of Starship 1 is to destroy alien spacecraft while manoeuvring through star and asteroid fields.

The game uses a first person perspective on a black-and-white monitor. The player's ship is controlled with a control yoke that is connected to two potentiometers. There is also a lever that controls whether the ship is moving "fast" or "slow". Compared to common arcade games of the time, Starship 1 was comparatively advanced, but used quite a bit of analog technology that would become less common in arcade games in following years.

As enemies appear onscreen, the player tries to center the enemy in the crosshairs and shoot it with his "phasors" by pulling a trigger on the control yoke. Alternatively, the player has 5 "proton torpedoes" per game that can be fired by pressing a large white button on the dashboard. This will destroy any enemy ship on screen, regardless of whether it is in the crosshairs (which are painted directly on the screen).

According to research by Ed Fries, Starship 1 contains the first known Easter egg in any arcade game. Fries confirmed with Milner that by activating the machine's controls in the appropriate order, the player could have the message "Hi Ron!" (in reference to Milner) pop up on screen and let him play 10 free games.

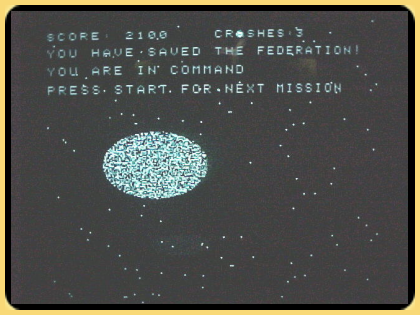
The game came in a huge cabinet. It feature space oriented side art graphics showing a ship in the Starship 1 design flying around leaving multicolored trails behind while it's shooting at an enemy spacecraft. The victim ship shown is blowing up into pieces. The front of the game has a bezel that contains the game's marquee and the left and right speakers at about ear level.

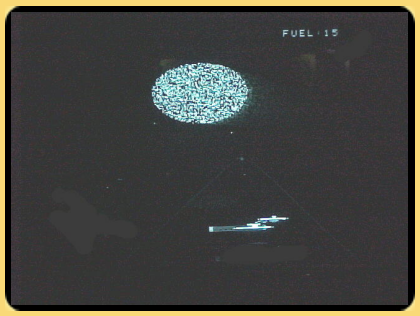
Just inside of the outer plexiglass there is a cardboard bezel that goes down the left and right sides and along the bottom. It is a 3-D rendering

of what appears to be a space station with men in space suits walking around it. The spaceman on the left is a separate piece that is waving into the game in front of the station graphic. It is lit up by the light from the marquee passing through a dark blue plastic mylar piece. There are background graphics that are illuminated by a black light bulb inside so the image appears to be flying through space with the stationary background stars and galaxies.

The front monitor surround appears to have been mostly white plastic, however at least 1 reported factory painted blue one. Mike Jang, the designer of Atari video game cabinets during that time, says he does not remember seeing any other than white. He suggests it could have possibly been built at the Ireland plant. An "arcade-museum user" own one of these blue surround models, so it does exist. At the end of a game 2 various saying will be displayed. One simply saying to deposit a quarter to be the captain of Starship 1, the other say that 'Sensors detect another quarter in your pocket, deposit it to be the captain of Starship 1'.

"arcade-museum.com"





excerpt from the flyer:

Your Next Mission — A New Profit Frontier.

Starship 1™ is another fantastic Atari first. This incredibly realistic video sensation goes where no game has gone before!

Suspense, speed and manoeuvring skill highlights Starship 1's exciting play action.

Realistic cockpit controls guide the starship up, down, left and right to intercept and zero in converging "laser" beams, activated by fire buttons on the controls, on approaching targets. Or manoeuvre over and around hostile plantes to avoid crashing. Players can also lever-select "fast" or "slow" speeds.

Four different types of spacecraft targets, as well as planets appear at random and at varying speeds, growing larger as they approach giving the player the illusion of speeding through space. (And each game play is different so there is always a new challenge.)

Five "proton" torpedoes per game, activated by a push button on the control panel, also let the player blast planets and enemy targets.

Scoring is accumulated by the number of targets destroyed by laser or torpedo fire. Each target is assigned different point values.

Previous high score is displayed allowing players (and spectators) to compare and try for higher point values.

The bad guys have a chance too. If the player crashes into an enemy ship or planet, there's a screen-filling explosion and a temporary slowdown penalty.

Exclusive Operator Options.

Extended Play. "Hyperspace" bonus time can be awarded.

Coinage. 1 coin per play. 2 coins per play or 2 players per coin.

Coinage. 1 coin per play. 2 coins per play or 2 players per coin.

Exclusive New Coin Door.

Starship 1 also comes with the new Atari coin door and acceptor mech designed for tamper-proof, jam-free operation.

Exclusive Self-test Program.

Along with thorough distributor and factory service backup. Starship 1 has a unique built-in test program that displays all microprocessor and memory function including switches and options for easy *on-the-spot* checking and trouble-shooting.

Dimensions.

Height: 73". 185.5 cm; Width: 29.5". 75 cm; Depth: 36". 91.5 cm.

Lift Off!

Take advantage NOW of the new excitement and popularity of sci-fi and space war themes. And watch your profits BLAST OFF!

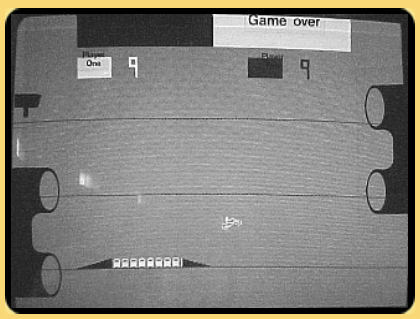
Stunt Cycle

Manufacturer *Atari*
Release *1976*
Class *Wide Release*
Genre *Skill*
Mode *2 Players*
Gameplay *Alternating*
Panel Layout *Single Player*
Controls
Motorcycle Controls: *Throttle, Brake*
Hardware *Atari Discrite Logic*
Game Specific *Stunt Cycle Pinout*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Conversion Class: *Atari BW Raster*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Stunt Cycle is a 1 player (or 2 players alternating) arcade game by Atari Inc., originally released in 1976. It attempted to cash in on the Evel Knievel craze of the mid 1970s by allowing the player to perform their own simulated motorcycle jumping stunts.

Gameplay

The screen is divided into three horizontal platforms connected by tubes on the monitor overlay. The motorcycle automatically drives across each platform in sequence: left to right, right to left, then left to right again. The bottom most platform has a line of parked buses between two ramps, and the goal is to successfully jump the buses and land safely before repeating the process again.



The game is housed in a custom cabinet that includes a simulated motorcycle steering column mounted on the control panel. The right side handle grip is twisted for acceleration. The monitor is a 19-inch black and white CRT monitor with a black and white overlay. Sounds include a motorcycle roar, crash sounds, and crowd cheers.

The player can only accelerate (via the right handlebar) and brake. Accelerating too quickly will result in a wheelie and, if speed is not decreased, flipping over backward and crashing. Speed carries over from one platform to the next. On the third platform, the cycle has hit to the landing ramp to avoid a crash.

In 1980, Atari programmer Bob Polaro began to develop a Stunt Cycle port for the Atari 2600 using full color graphics. By the time it was completed, Atari had decided to turn it into a television tie-in game for the Dukes of Hazzard franchise instead. This game never progressed beyond the prototype stage and was not officially released, however Bob Polaro independently released 50 copies of Stunt Cycle in 2003.

excerpt from the operation manual:

PHYSICAL DESCIPTION

Atari's "Stunt Cycle" is a motorcycle video action game designed for one or two players. Thed game is packaged in its own distinctively styled upright cabinet that rests directly on the floor. A 19-inch black-and-white TV monitor is mounted at the top of the cabinet and players stand in front, facing the TV screen.

A horizontal strip of transparent material is affixed to the picture tube. This strip covers the normally black area near the top of the screen. Its left half reads "Extended Play"; the right half reads "Return Hand Throttle to Idle". In addition, two other small transparent strips, one next to each score, read "Player 1" and "Player 2".

The player-operated controls are located on a horizontal flat panel, beneath the TV monitor. The controls consist of the one-player start and two-player start push buttons, plus a set of handlebars with a "throttle" on the right grip.

Two identical coin mechanisms are located below the player-operated controls. They accept quarters only, and are connected so that either one can initiate play. The Stunt Cycle game features and owner/operator-adjustable option that permits on-site game structuring for either one or two credits per coin. The cash box is located behind the coin mechanism access door. A speaker mounted inside the cabinet, to the left of the coin mechanism, will produce a variety of game sounds during play.

BRIEF DESCRIPTION OF PLAY

In the Stunt Cycle game, a player tries to jump as may buses as possible. Each successful jump increases the row of one bus. After an operator-selected number of buses is reached, the player receives a free game and continues jumping, as long as no more that a pre-set number of

crashes occur. There is no game timer: the game ends when the player tries to jump a given set of buses and is unsuccessful after a pre-set number of attempts.

A player must "rev up" to the proper speed by the time he or she has reached the take-off ramp: too slow a speed will cause the cyclist to descend to early and crash.

Regardless of the number of buses to be jumped, the game always has the same degree of difficulty. There is a certain zone beyond the landing ramp within which one must land. Should the player be going too fast over the buses and land beyond this safe-landing zone, the jump is considered a crash.

In addition to proper speeds required for jumping the buses, one must not accelerate too much on the two approach tracks (the two uppermost black lines on the monitor). Doing so will cause the player's cycle to do "wheelies"; in extreme cases the bike will flip over backwards which counts the same as a crash while jumping. However, driving too slowly in this stretch will not impair the player's score. The scoring is simple: one point is gained for each successful jump.

Along with the video action just described, the following sounds produced by the speaker during play add to the game's excitement:

Upon acceleration, the motor sound increases in pitch. Doing "wheelies" at controlled speeds without flipping produces no special sound other than the regular motor sound. Doing "wheelies" and flipping over backwards, however, produces a screeching sound.

Performing a successful jump produces a crowd cheer sound. And finally, performing an unsuccessful jump and landing on a bus produces a twang with each bounce; then a crash sound is made as the cyclist lands on the ground.

excerpt from the flyer:

Daredevil thrills

Now the people who brought motor sports racing to a video track brings your customers a fantastic motorcycle jump and stunt attraction.

Realistic handgrip throttle control accelerates motorcycle. Riders try to jump over an increasing number of buses without crashing — more than 8, it's a wipeout! The roar of acceleration, crashing, the cheer of the crowd — high speed wheelies over more and more buses add to the excitement... and your profits. Stunt Cycle, lets you capitalize on everybody's interest in daredevil bike riding.

High Rev profits.

Stunt Cycle is a completely new video concept and with built-in Atari exclusive features, you and your customers can be instant superstars.

Tank 8

Manufacturer *Kee Games*
Release *1976*
Class *Wide Release*
Genre *Labyrinth/Maze*
Mode *8 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Joystick: *2-way (up, down)*
Joystick: *2-way (up, down) with button [Fire]*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Color 19-inch Motorola*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*

Tank 8 is similar to the previous Atari Tank games except it is color instead of black and white and there can be up to eight players who each get to control a differently colored tank. The colors of the tanks are red, light blue, dark blue, yellow, white, green, purple and orange.

The Battle arena is filled with barriers and "X"s that represent land mines. The game is viewed from a overhead perspective by eight players who individually maneuver their uniquely colored tank in an effort to shoot the other.

Tank 8 had two modes free-for-all and team-play. In free-for-all mode players get points for every kill. In team mode, tanks were red or blue and points were scored only for killing members of the opposite team. In a design that was ahead of its time, players did have to watch out to make sure they didn frag members of their own team.

"arcade-museum.com"

excerpt from the flyer:

Front-line profit action. One of the most successful video games in the industry is now available in an 8-player, color version. TANK 8 is designed for high volume action and repeat play — and heavy earnings.

New ammunition. Whether your customers are veteran Tank commanders or rookies, TANK 8 offers a whole new challenge and more exclusive Atari features. The battlefield is filled with barriers and mines. "Blown up" tanks also add to the obstacles. All-new joystick controls are easier to use — like the real thing. Tanks are faster, more mobile. TANK8 is designed for individual or team play. Electronics are new, more advanced. Realistic sound effects — roaring tanks, explosions, gunfire and "taps" near the end of the battle add to the attraction and excitement. Four hinged coin doors, locking cashboxes and lightweight easy-to-assemble construction round out TANK 8's exclusive features.

Dollar Bill Acceptor, exclusive option.

TANK 8 can be ordered with a Rowe dollar bill acceptor. Instead of 8 plays at 25¢ each, you can add an extra savings incentive —8 plays for only $1.

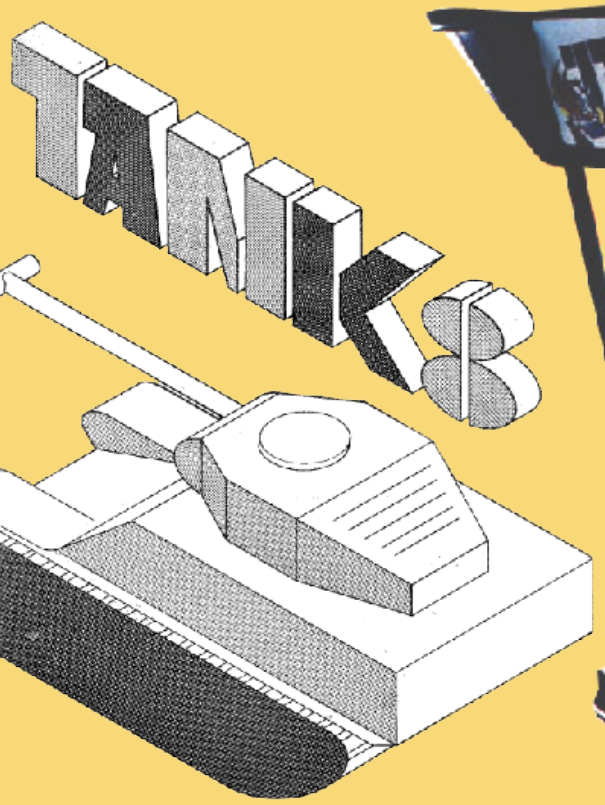
No battle fatigue. TANK 8 is built for heavy action. Durastress™ -tested solid state reliability means less down-time, non-stop earnings. All-steel frame construction, and molded fiberglass control panel means tank-tough indestructibility and large removable side panel mean easy accessibility to components.

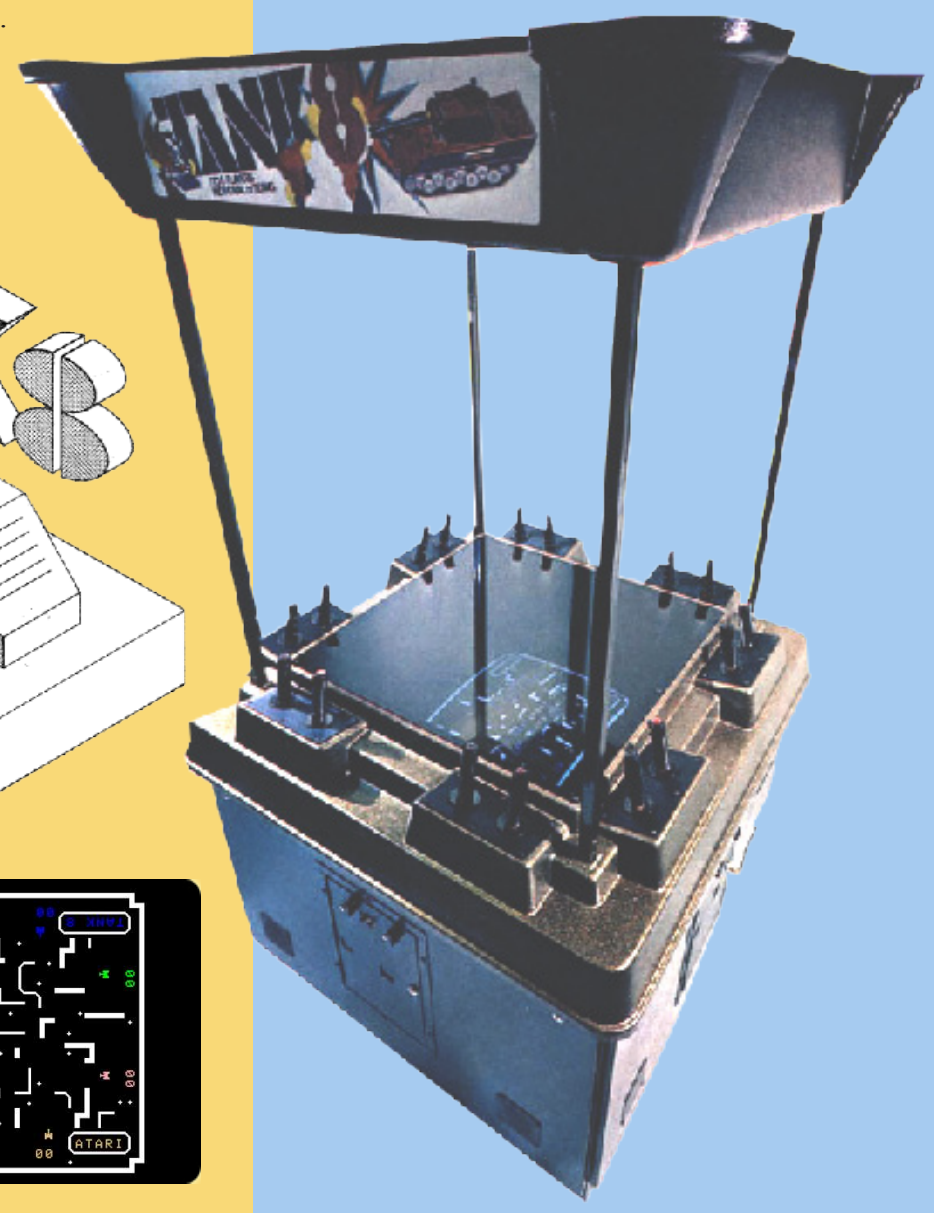
Exclusive Atari "Instapart"™ service backup supplys you with spares in less than 48 hours.

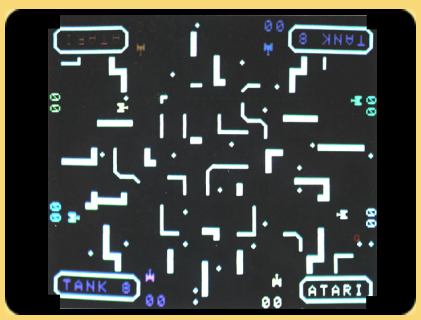
Dimensions: Height: 68", 171cm; width: 44", 111cm; depth: 44", 111cm.

Mobilize your attack force.

TANK 8 is going to sell out fast.

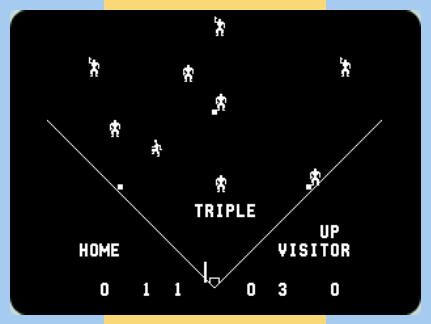






Tornado Baseball

Manufacturer *Midway Manufacturing Co.*
Release *1976*
Class *Wide Release*
Genre *Baseball*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Controls
Joystick: *2-way (left, right) [Defense Left, Defense Right]*
Joystick: *8-way [Slow Pitch, Fast Pitch, Curve Left, Curve Right]*
Buttons: *2 [Home Bat SwingVisitor Bat Swing]*
Hardware *Midway 8080*
Game Specific *Tornado Baseball Pinout*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
The image is mirrored. The back drop is a baseball field, lit with a blacklight.
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*
Cocktail



Tornado Baseball is a baseball arcade game which was released by Midway Games in 1976; it runs on an Intel 8080 microprocessor (running at 1.9968 MHz), and was one of the first baseball games to have a lot of players on the field simultaneously. As with Gun Fight, this is a two-player title, and both players will play on the same $0.25 - the pitching player must use one 8-way joystick to select one of eight different pitches, while using a second 2-way joystick, to move the outfielders left and right. The batting player, however, may only use one button to swing his bat; both players will also be using the same set of controls, and they will have to shift left or right every time three outs occur. The number of innings players will receive for one coin depends on how the cabinet is set, but if it is less than nine, they will have to insert another coin if they want to continue with the remaining ones.

This is the first game in the Midway Baseball series. It was followed up by three sequels: Double Play (1977), Extra Inning (1978), and Extra Bases (1980) (the last of which was presented in colour, given that it ran on Midway's Astrocade hardware); because Extra Bases also came in a cocktail cabinet as opposed to an upright, the screen would flip to face the pitching player each time three outs occurred.

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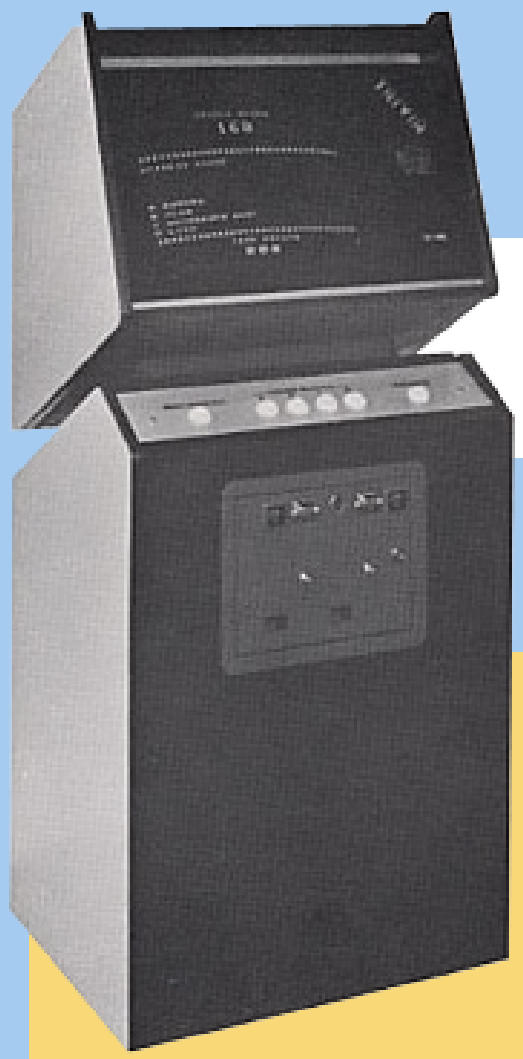
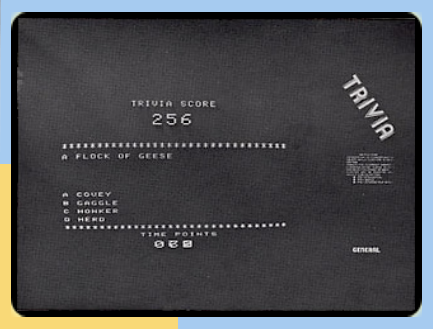
Trivia

Manufacturer *Ramtek*
Release *1976*
Genre *Trivia*
Cabinet Styles *Upright*





A trivia question and answer game from Ramtek. The 2000 trivia questions were stored on a 8-track tape cartridge.

excerpt from the flyer:

A new and different video game that tests players speed of recall and knowledge of Trivia. Ramtek's fast paced scoring system makes this an exciting game — challenging the player against the clock. Selectable categories containing 2000 Questions and stored on Ramtek's eight track tape cartridge allows for future new tapes and long term earning power.

- 25¢ Per Play
- Four Selectable Categories
- 2000 Totally Random Questions
- Free Back-Up Tape
- Solid State Logic
- One Year Logic Board Warranty

OPERATOR SELECTABLE

- Length of Play
- Extended Bonus Play

US Billiards

Manufacturer *US Billiards*
Release *1976*
Genre *Pool*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Color*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Upright*
Table

US Billiards is a colourful pool game with four different types of play: 8-Ball, Rotation, 11-Count and Carom Billiards.

excerpt from the flyer:

"OUR NAME IS THE GAME"

2 Proven money-makers — The super-popular game of pool and the modern format of video games. A sure-fire successful combination.

SPECIFICATION

- 1 or 2 Players
- 19" Motorola Monitor
- Electrical Counter
- Push Button Controls mean Trouble-free Operation

Video Action 2

Manufacturer *UPL*
Release *1976*
Class *Wide Release*
Genre *Ball and Paddle*
Mode *4 Players simultaneous*
Gameplay *Either*
Panel Layout *Multiple Player*
Hardware *Discrete logic*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Cocktail*

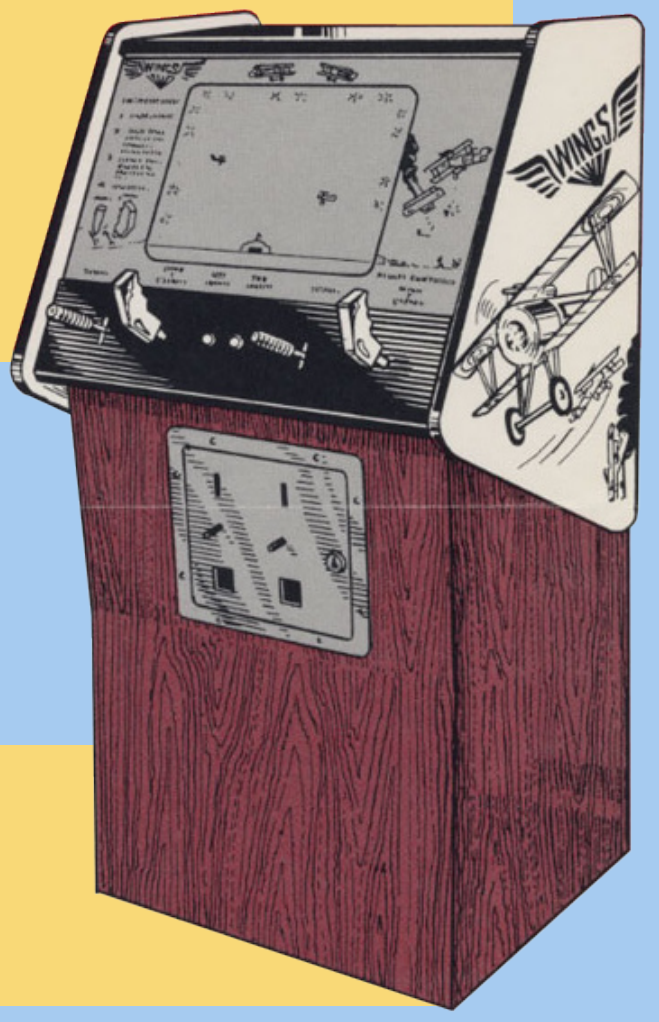
Video Action 2 is a two or four players play Pong-type games including hockey, soccer and tennis. Octagon shaped table top game.

Wings

Manufacturer *Electra*
Release *1976*
Class *Wide Release*
Genre *Shooter*
Mode *2 Players simultaneous*
Gameplay *Competitive*
Panel Layout *Multiple Player Ambidextrous*
Monitor
Orientation: *Horizontal*
Type: Raster: *Standard Resolution*
CRT: *Black and White*
Controls
Joystick: *2-way (up, down)*
Joystick: *2-way (up, down) with button [Fire]*
Sound *Amplified Mono (one channel)*
Cabinet Styles *Cocktail*

WINGS

Wings is an air combat game where two planes circle and close in for the kill.

excerpt from the flyer:

Air combat at its best. Two planes circling, manoeuvring and finally closing for the kill.
One or two-player with Robot feature — man against man or against the machine.
The individual player scores by shooting down his opponent. If protagonists collide, both plummet to the ground.
Control sticks enable player to climb, dive, fire guns and adjust speed.
Solid state monitor. Adjustable game length. Realistic aircraft and explosions sounds.